TEES AERO REPORT TR 87-2

MEASUREMENT OF THE EFFECT OF MANUFACTURING DEVIATIONS ON NATURAL LAMINAR FLOW FOR A SINGLE ENGINE GENERAL AVIATION AIRPLANE

TEXAS ENGINEERING EXPERIMENT STATION

AEROSPACE ENGINEERING DIVISION

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College Station, Texas

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ABSTRACT

Renewed interest in natural laminar flow (NLF) has rekindled designers' concerns that manufacturing deviations, (loss of surface contours or other surface imperfections) may destroy the effectiveness of NLF for an operational airplane. This report summarizes experiments that attempted to measure total drag changes associated with three different wing surface conditions on an airplane typical of current general aviation high performance singles. The speed power technique was first used in an attempt to quantify the changes in total drag. The transition locations for the wing's boundary layer was set both naturally in free flight conditions and artificially with transition strips at three different chordwise locations. These total drag comparisons were unreliable, partly due to the inherent uncertainty of the speed power technique and partly due a faulty torquemeter that went undetected until after the test airplane had been returned to its production configuration. Predicted and measured boundary layer transition locations for the three different wing surface conditions were also compared, using two different forms of flow visualization. The three flight test phases included: (1) assessment of an unpainted airframe, (2) flight tests of the same airplane after painstakingly filling and sanding the wings to design contours, and (3) similar measurements after this airplane was painted. In each flight phase, transition locations were monitored using either sublimating chemicals or pigmented oil. Two-dimensional drag coefficients were estimated using the Eppler-Somers code and measured with a wake rake in a method very similar to Jones' pitot traverse method. The net change in two-dimensional drag coefficient was approximately 20 counts between the unpainted airplane and the "hand-smoothed" airplane for typical cruise flight conditions.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS

AR = aspect ratio
C_L = airplane lift coefficient
C_D = airplane drag coefficient
C_{Do} = airplane drag coefficient at zero lift
C_{Df} = airplane skin friction drag coefficient
c = wing geometric chord
c_d = 2-D drag coefficient
e = airplane efficiency factor
K = coefficient of C_L^2 in drag equation

MEASUREMENT OF THE EFFECT OF MANUFACTURING DEVIATIONS ON NATURAL LAMINAR FLOW FOR A SINGLE ENGINE GENERAL AVIATION AIRPLANE

INTRODUCTION

There is a growing interest in the use of natural laminar flow for general aviation airplanes, fueled by the work of Holmes[1] and his coworkers at the NASA Langley Research Center. In 1983 Mooney Aircraft Corporation and Texas A&M University received a grant to investigate the effects of deviations from airfoil design contours due to manufacturing errors for a general aviation airplane that depends on substantial use of laminar flow for its performance. The objective of this research was to add to the rather limited data base that quantifies the importance of manufacturing deviations to attaining and maintaining laminar flow. Ultimately, manufacturing standards that can be accepted by the general aviation industry are sought. A production airplane that uses laminar flow wing design and for which there is considerable production experience, the Mooney 231, was chosen as a source of additional data. The test airplane, N1173W, was selected at random from the Mooney production line for the project.

Experimental Approach

From the beginning of the project there were open questions as to how best to measure drag increments of the size that were anticipated. Flight test measurement of drag has always been a rather uncertain process. Though initial tests included carefully flown speed power points to establish the drag polar of the overall airplane, these tests were not expected to adequately document the changes in drag associated with changing transition location. Consequently, provision was made to measure two-dimensional airfoil drag at a representative wing station with a wake probe.

Comparisons of predicted and measured boundary layer transition, total drag, and two-dimensional drag coefficients were made. Flight measurements of the boundary layer transition locations were made using both sublimating chemicals[2] and oil flow visualization[3,4] techniques. Oil flow measurements

provided more information in less test time and both methods gave transition locations that were essentially identical. These measured boundary layer transition locations were also compared to predictions from the Eppler–Somers code.

Measurements were made for three different surface conditions to quantify the changes in performance as the wing contours were improved. First, a photogrammetry technique was used on the bare, unpainted wing to measure the actual airfoil profiles. Points for this technique covered both the upper and lower surfaces, but extra points were taken at wing station 133.0 and compared to the Mooney drawings for that station. These geometric data were used as input to the Eppler–Somers code and predicted aerodynamic coefficients were obtained. Unfortunately, the photogrammetry was very expensive and required extensive data reduction outside project resources. This cost and specialized data reduction precluded obtaining corresponding measurements after the wing was filled and painted. Consequently, the lofted contours of the airfoil section at this same wing station were used for comparing to the experimental measurements for the filled and for the painted surface conditions. A conventional rotating wake probe, manufactured by Mooney and similar to the one used by Gregorek[9], was then used to carefully measure the two-dimensional drag coefficient at wing station 133.0 on the right wing for each of the three surface conditions. These three sets of data take the airfoil profile from its "as-manufactured" condition to the "best" condition attainable with current sheet metal manufacturing and finishing techniques.

Aircraft Configuration

The Mooney 231 is a turbocharged, single engine general aviation airplane utilizing the first generation of laminar flow airfoils. Table 1 gives the leading particulars of the basic airplane and Fig. 1 is a three-view drawing of the test airplane. An NACA 63_2215 is used at the root chord and an NACA 64_1412 is used at the tip with a geometric twist of -1.5^o in the wing. Airfoil sections between these basic ones were obtained by fairing the coordinates of these two airfoils along the spanwise stations.

Table 1. Test Aircraft Specifications

Dimensions	
Span	36.08 feet
Height	8.33 feet
Length	25.42 feet
Areas	
Wing	174.79 square feet
Horizontal Tail	34.42 square feet
Vertical Tail	14.05 square feet
Flap	17.90 square feet
Aileron	11.40 square feet
Elevator	13.00 square feet
Rudder	6.25 square feet
Weights	
Approximate Empty Weight	1793 pounds
Typical Takeoff Gross Weight	2885 pounds
Wing Loading	16.6 pounds/square foot
Power Loading	13.8 pounds/horsepower
Wing	
Airfoil (WS 20.092)	NACA 63_2-215
Airfoil (WS 210.970)	NACA 64_1-412
Geometric Twist	-1.5°
Incidence	2.5°
Dihedral	5.5°
Aspect Ratio	7.448
Taper Ratio	2.271
Chord at BL 0.00	86.06 inches
Chord at WS 217.50	37.90 inches
Mean Aerodynamic Chord	61.00 inches
Powerplant	
Engine	Continental TSIO-360-GB
Sea Level Horsepower Rating	210 HP at 2700 RPM
Propeller Diameter	74 inches
Total Fuel Capacity	80 US gallons
Engine Oil Capacity	8.0 US quarts

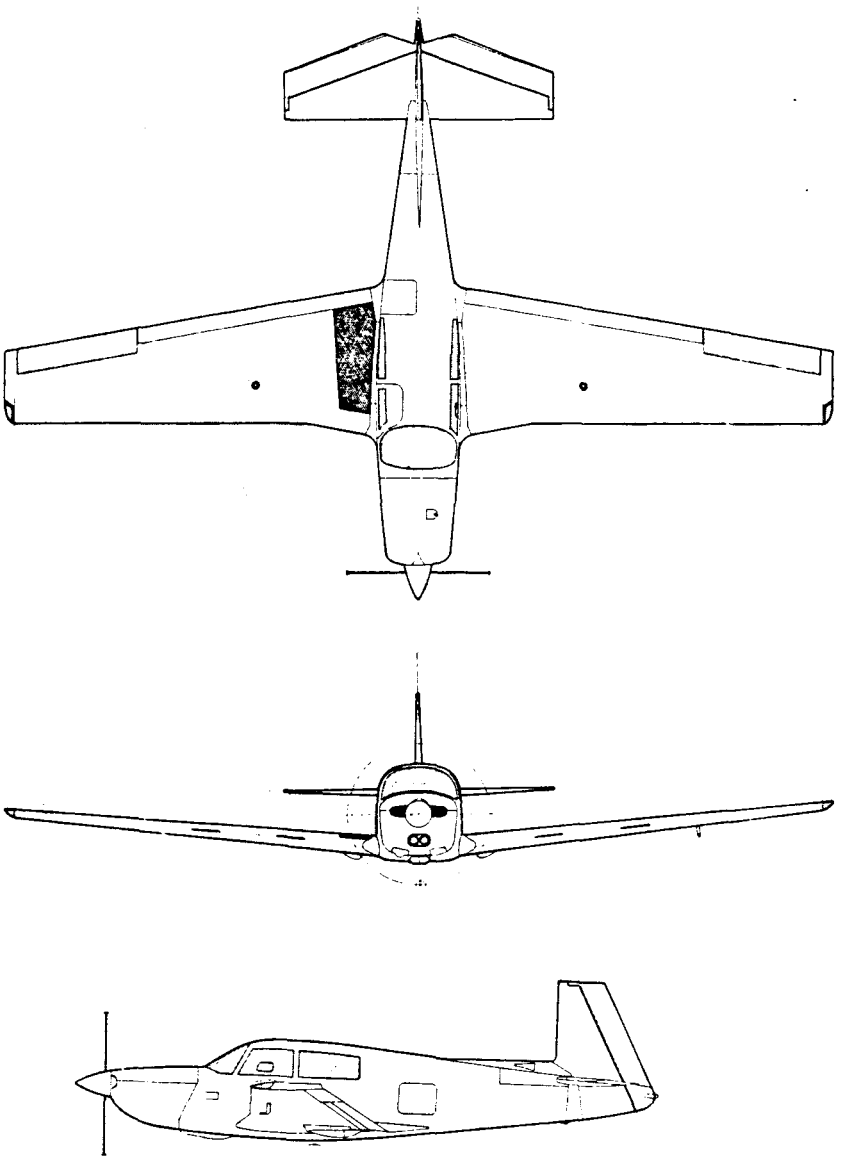

Fig. 1 Three-View of Test Aircraft

Instrumentation

The aircraft was instrumented with vanes to measure angle of attack and sideslip, with pressure belts to measure surface pressures over a section of the wing, with a wake rake to measure pressure losses, and with a torquemeter to measure power output from the engine. Pressures were routed through a standard 48-port stepping valve and measured with a diaphragm-type transducer, both provided by Texas A&M University. Mooney supplied their COMPUDAS airborne data acquisition system to record these parameters on casette tape. Of course, not all the instrumentation was installed for every test; for obvious reasons, the pressure belt was removed before the two-dimensional drag

measurements were made with the wake rake. Similarly, neither the wake rake nor the pressure belt was installed for the speed power tests.

Data Reduction

Initial data reduction was carried out by Mooney engineers reading the raw data files from the COMPUDAS casettes into an IBM personal computer. The personal computer and commercial spreadsheet software were used to reduce the data to engineering units and rough plots. The raw data, the engineering units results, and the rough plots were then forwarded to Texas A&M for further reduction and comparison to predictions from theory and computer analyses.

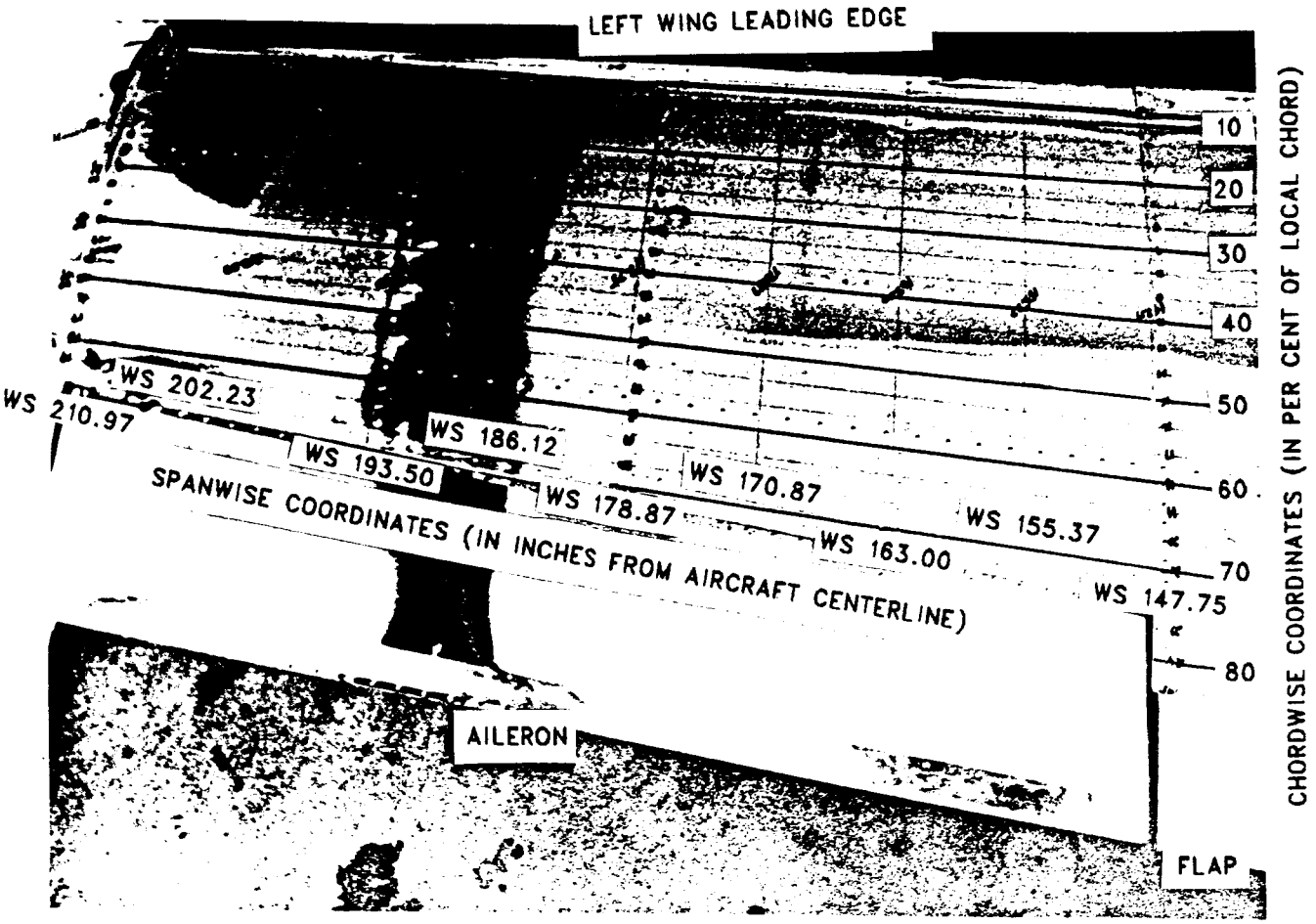

Fig. 2 Grid Used to Determine Transition Locations

TEST RESULTS

Test results are reported in the following section under three main headings: preparatory tests, tests of the complete airplane, and two-dimensional drag measurements.

Preparatory Tests

Several preliminary measurements and calibration tests were done in preparation for the actual flight measurements. First, a grid was established and marked on the wing, establishing per cent chord reference lines. Fig. 2 is a photograph illustrating the grid markings used. These reference markings were used during all later flow visualization flights to measure transition locations.

Photogrammetry. One of the most difficult questions faced in the planning phases of the project was: How close are the design contours to the actual manufactured airfoil sections? Various schemes have been used to try to measure these contours--from templates to plaster of paris molds to digitizing tables. Recently, photogrammetric mensuration has been applied to parabolic antennae, space shuttle substructures, and wind tunnel models. Accuracies of 1 part in 80,000 have been achieved with this technique[6], which promised to give three-dimensional accuracies of ±0.003 of an inch at any point on the semi-span of the wing. To explore the practicality of this technique, arrangements were made to make such measurements on the test airplane at the Mooney plant in October-November 1983. The photographic data were forwarded to NASA Langley where Mr. Richard R. Adams digitized and tabulated the data. Unfortunately, the scale tape for the photographs of the right wing was lost in shipment between the firm making the measurements and NASA Langley. This loss forced Mr. Adams to use scaling for the left wing targets in converting the photographic measurements for the right wing to cartesian coordinates. Eventually, over 400 points were obtained to discretely represent the upper and lower left wing surfaces. By attaching the retroreflective tape targets as close as possible near the leading edge, 87 points were photographed to characterize right wing station 133.0, where two-dimensional drag coefficients were measured in flight. The forward 8% of the upper surface of the airfoil lofted by Mooney designers is compared with the photogrammetry measurements in Fig. 3. The scale for Fig. 3 is purposely large to emphasize the very small

differences that are involved in the contours. Notice that only five measured photogrammetry points (excluding the leading point which was not directly measured) were obtained from the photogrammetry. The fact that the retroreflective targets were approximately 0.25 inches in diameter set the lower limit for spacing of the points.

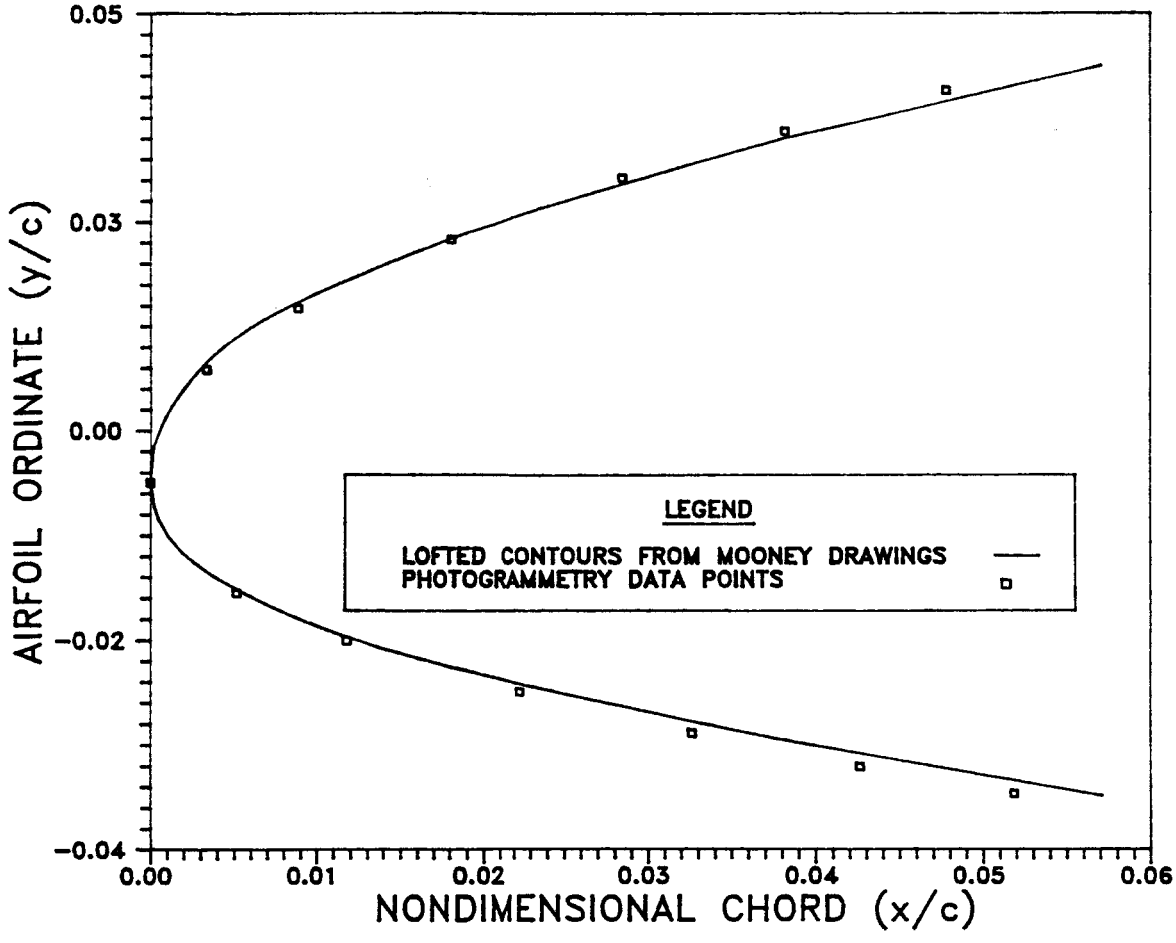

Fig. 3 Comparison of Photogrammetry Measurements and Lofted Contours at Right Wing Station 133.0

Pitot–Static Calibration. Before precise performance measurements were possible it was necessary to confirm the static pressure error correction for this airplane. A modified tower flyby technique was used to calibrate this system. The only change to the usual procedure was that Mooney used a locally manufactured optical tracker to determine the airplane's altitude. This calibration was repeated four times during the program whenever any changes were made to the configuration. The data compared favorably to previous

Mooney static pressure system calibrations with the largest deviations on the order of 0.6 knot. Typical results are given in Fig. 4.

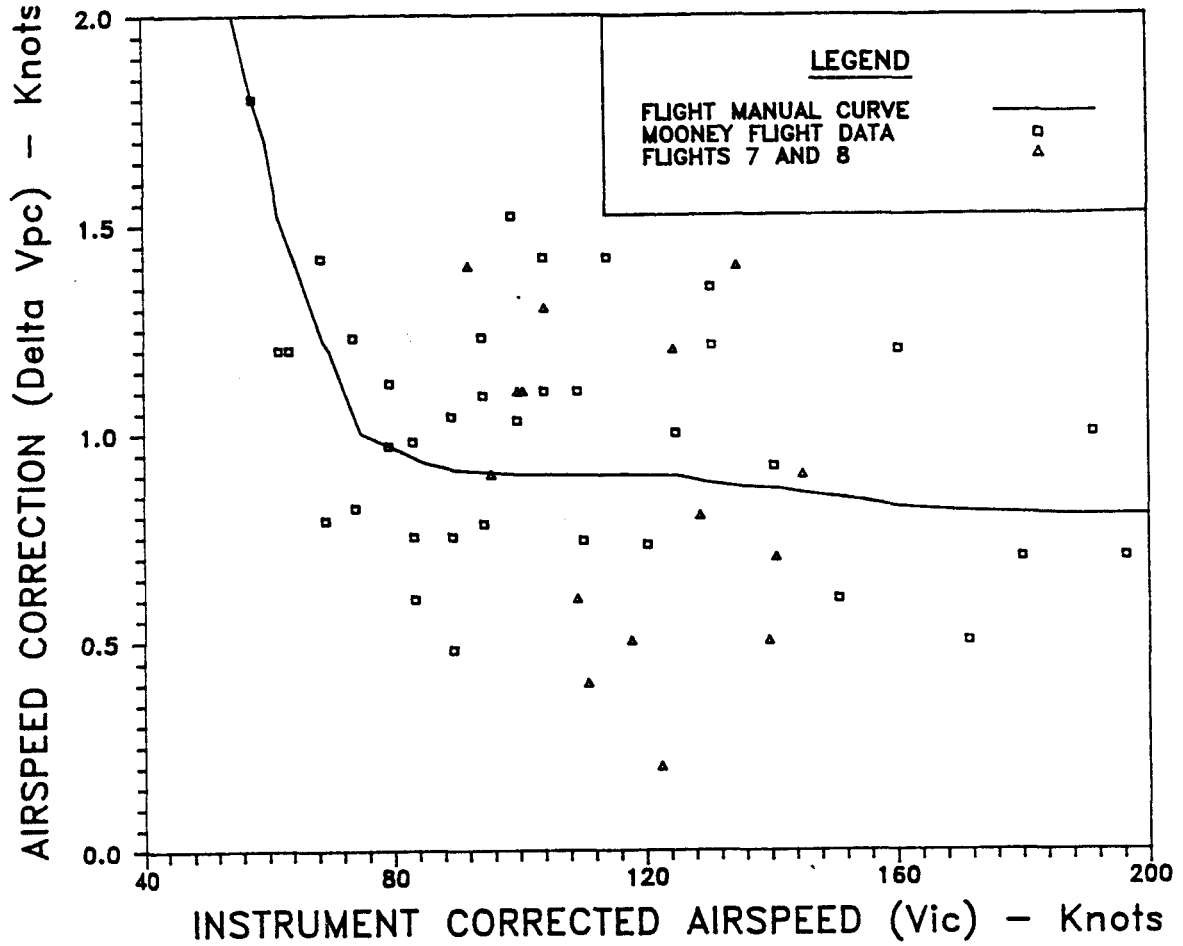

Fig 4. Typical Pitot-Static Calibration

Total Drag Measurements

Speed power tests are the most commonly used flight test method for obtaining the overall drag curves for an airplane. Unfortunately, there are several unknowns that preclude measurement of the airplane drag polar with enough precision to accurately estimate the changes in skin friction drag associated with small shifts in the transition location. When these tests were begun, Mooney personnel hoped to be able to minimize this uncertainty by careful attention to speed power measurements and at least approximate the changes in skin friction drag with speed power drag polars; but the data suggest that this goal was not attained.

Baseline Airplane. The unpainted airplane was used as the baseline configuration. Speed power data were taken on seven different flights during the first phase of the program. After some initial difficulties with the torquemeter and skin repairs necessitated by a gear up landing, the drag polar shown in Fig. 5 was obtained. A straight line was fitted through all the points to give the best measured drag polar for this baseline configuration.

$$C_D = C_{Do} + KC_L^2$$

where $K = 1/\pi eAR$

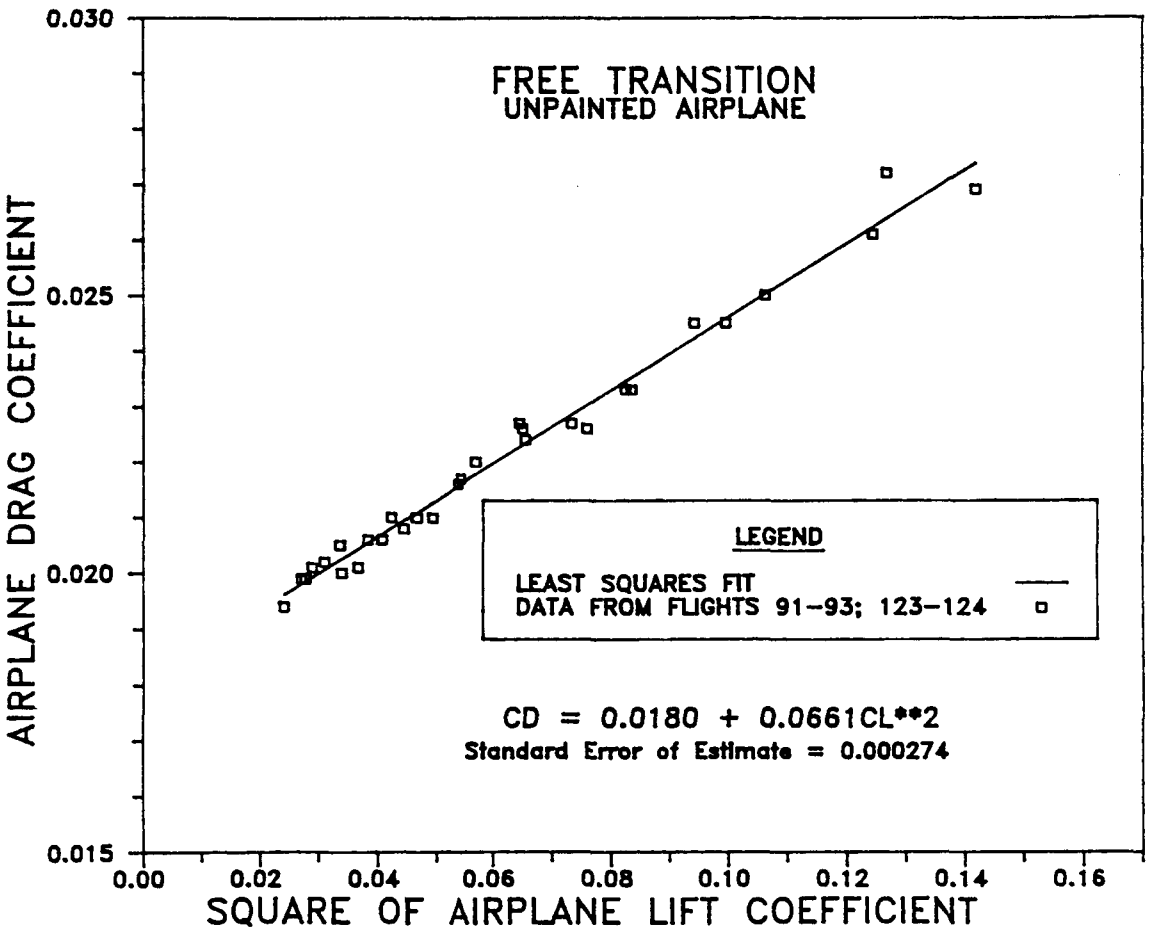

Fig. 5 Drag Polar for the Baseline Airplane

The parasite drag coefficient was approximately 4 counts under the value used by Mooney in their Pilot's Handbook, less than a 2% difference. However, the measured airplane efficiency factor using this technique was less precise. The

slope of this measured drag polar was 0.0661, giving an airplane efficiency factor (e) about 12% lower than that used in the Pilot's Handbook. While the "official" Mooney drag polar is hardly exact, this comparison indicated a highly uncertain slope for the drag polars based on speed power tests. The method looked even less attractive as a measure of small drag changes after reviewing these results.

Featherfilled Wing. After the wing was featherfilled, speed power measurements indicated that the minimum drag increased about 4 counts compared to the bare wing and the slope of the drag polar decreased to 0.0576, resulting in and efficiency factor within 1% of the standard Mooney value. While this result compared much more favorably with Mooney performance figures, the large change in slope from the value measured for the baseline airplane left considerable doubt about the accuracy of the airplane efficiency factor e.

Painted Wing. Painting the wing produced relatively small changes in the drag polar. The minimum drag coefficient was 0.0189, the same as the featherfilled condition, but the slope increased slightly, resulting in an airplane efficiency factor approximately 2% less than that for the standard Mooney 231. Fig. 6 illustrates the drag polar measured for this surface condition.

Fixed Transition. To check the feasibility of measuring drag changes due to different transition locations, strips of tape approximately 0.009 inches thick were fastened to the upper and lower surfaces of the wing at 5%, 10%, and 25% chord locations. Flow visualization was used to check that these strips did trip the boundary layer from laminar to turbulent. Speed power tests were then flown with these strips attached and Table 2 summarizes the differences in these measurements. Again, the trends in the minimum drag coefficient are surprisingly consistent but the slopes are less certain. For example, the measured change in C_{D_o} between natural transition and transition fixed at 5% chord was 15 drag counts. Using the Eppler-Somers code[11] with transition fixed at these two locations to predict the difference in two-dimensional drag coefficient produced an estimated change of 33 counts. (This estimate involved converting the calculated two-dimensional change to an equivalent three-dimensional C_D.) As Table 2 shows, the measured changes in drag using the speed power method were substantially different (approximately 50 to 75% less) from values estimated using this code. It is unclear whether these results indicate that the estimates based on the two-dimensional results are optimistic, that the measured three-dimensional results are pessimistic, or some combination of these two possibilities.

Table 2. Changes in Skin Friction Drag Coefficient

Transition Location	Calculated ΔC_{Df}	Measured ΔC_{Do}
.05c–.10c	0.0004	0.0001
.10c–.25c	0.0014	0.0004
.25c–Free	0.0015	0.0010
.05c–Free	0.0033	0.0015

Overall Observations. If a typical cruise lift coefficient of 0.2 is assumed for comparison purposes, the changes in total drag coefficient calculated from these measured drag polars seem unlikely. In every case C_D at these flight conditions is larger after the wing surfaces were filled, sanded, and painted than it was for the bare metal wing surfaces. Coupling this fact with the results concerning the uncertainty in the measurement of the slopes (K) and the differences cited between the Eppler–Somers calculations and the experimental data strongly indicates that speed power measurements did not adequately measure the changes in drag coefficient associated with shifts in boundary layer transition. As noted previously, this result was anticipated. (Later flight tests using the same torquemeter on a different airplane indicated that the torquemeter calibration may have been shifting erratically. However, by the time this possible instrumentation problem became known, the wing surfaces had been featherfilled and it was not possible to recover the original unpainted condition.) Confirmation of the inadequacy of these speed power measurements for this purpose pointed up the importance of conducting the two-dimensional drag measurements.

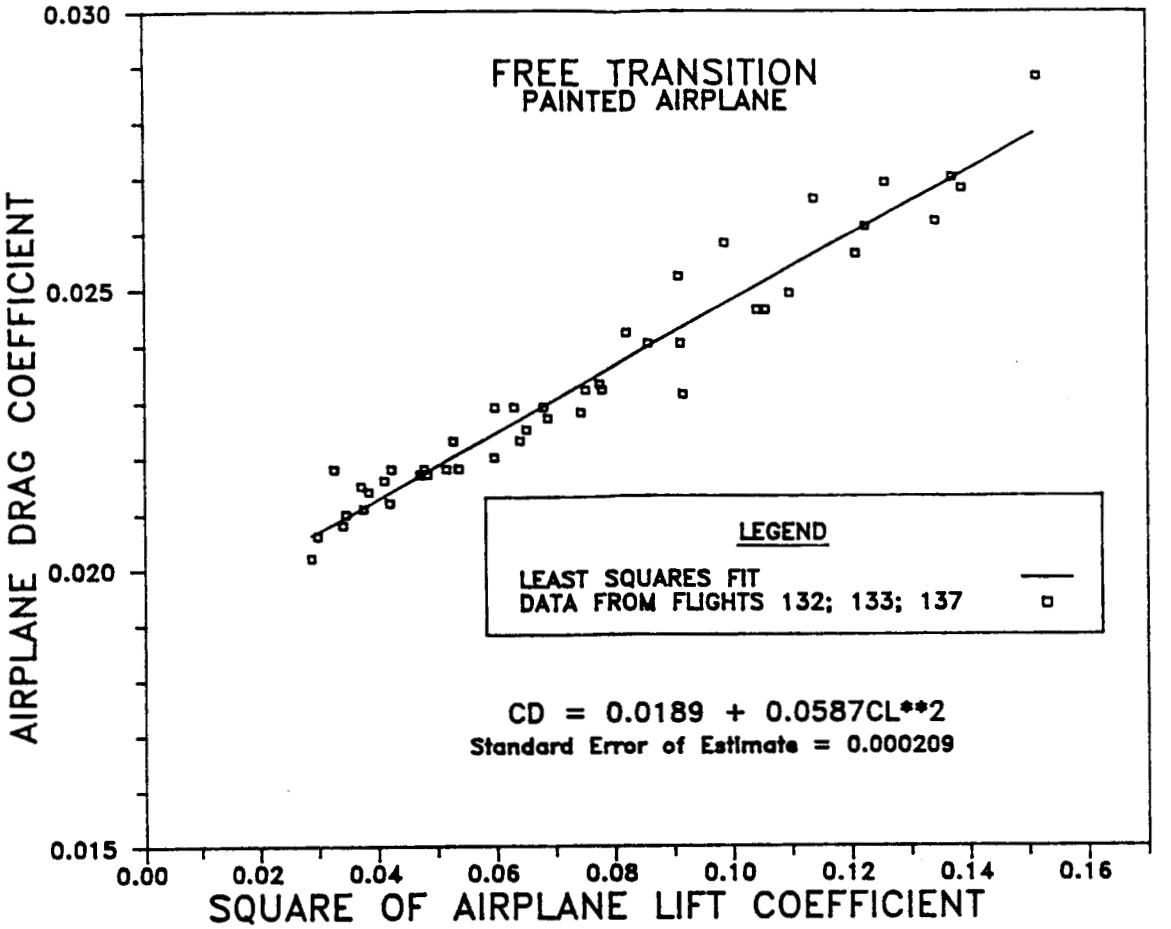

Fig. 6 Measured Airplane Drag Polar--Painted Condition

Two-Dimensional Drag Measurements

As mentioned previously, two-dimensional drag coefficients were measured using a wake probe at wing station 133.0 on the right wing. This probe measured both total and static pressure in the wake; however, the static pressure orifice was aligned with the chord line of the wing and no attempt was made to correct for the misalignment of the flow in the wake. Comparisons were made between two-dimensional drag coefficients calculated using static pressures measured in the wake and those calculated using measured free stream static pressure. The differences were small, on the order of 4 drag counts at low C_L and 10 drag counts at high C_L. The drag coefficients calculated using wake probe measured static pressure were slightly higher, but not quite as consistent in repeatability as those calculated with the boom static source as the reference. Because of this slightly improved repeatability, the

data discussed in the following sections are all referenced to the boom-measured static pressure.

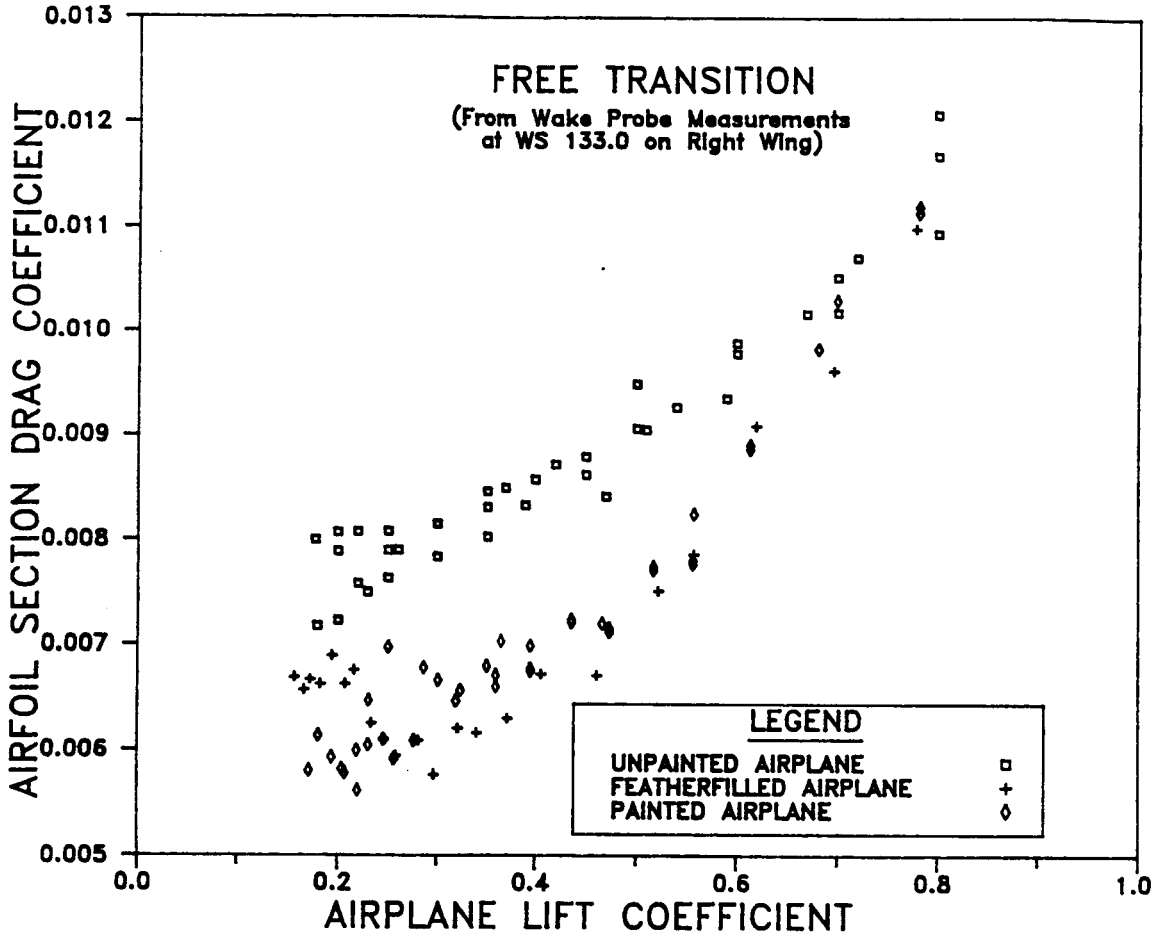

Fig. 7 Two-Dimensional Drag Coefficients--Natural Transition

Natural Transition. Fig. 7 summarizes the two-dimensional drag coefficients measured for each surface condition investigated. Each data point is the average of 3 or 4 wake probe sweeps at the same flight condition. These data are consistent in that the smoothed wing surfaces (featherfilled and painted) produced measurable drag reductions. At airplane lift coefficients of 0.2 to 0.3 (cruise) the smoothed surfaces reduced c_d by about 22 drag counts, a reduction of over 25% compared to the bare metal wing. As angle of attack increased, this difference decreased, a fact of little importance to the designer trying to improve cruise performance with laminar flow.

Fig. 7 also shows that painting the featherfilled surface had little or no effect on measured two-dimensional drag coefficients. Painting the surface after featherfilling produced essentially no change in c_d except at a C_L of about 0.2. In fact most of the data show a slightly lower c_d prior to painting the surface, but the differences lie well within the measurement uncertainty. The obvious conclusion is that eliminating surface irregularities that deviate from the design contours is far more important for drag reduction than simply painting the airplane. Painting the airplane without correcting the airfoil contours may even be counterproductive.

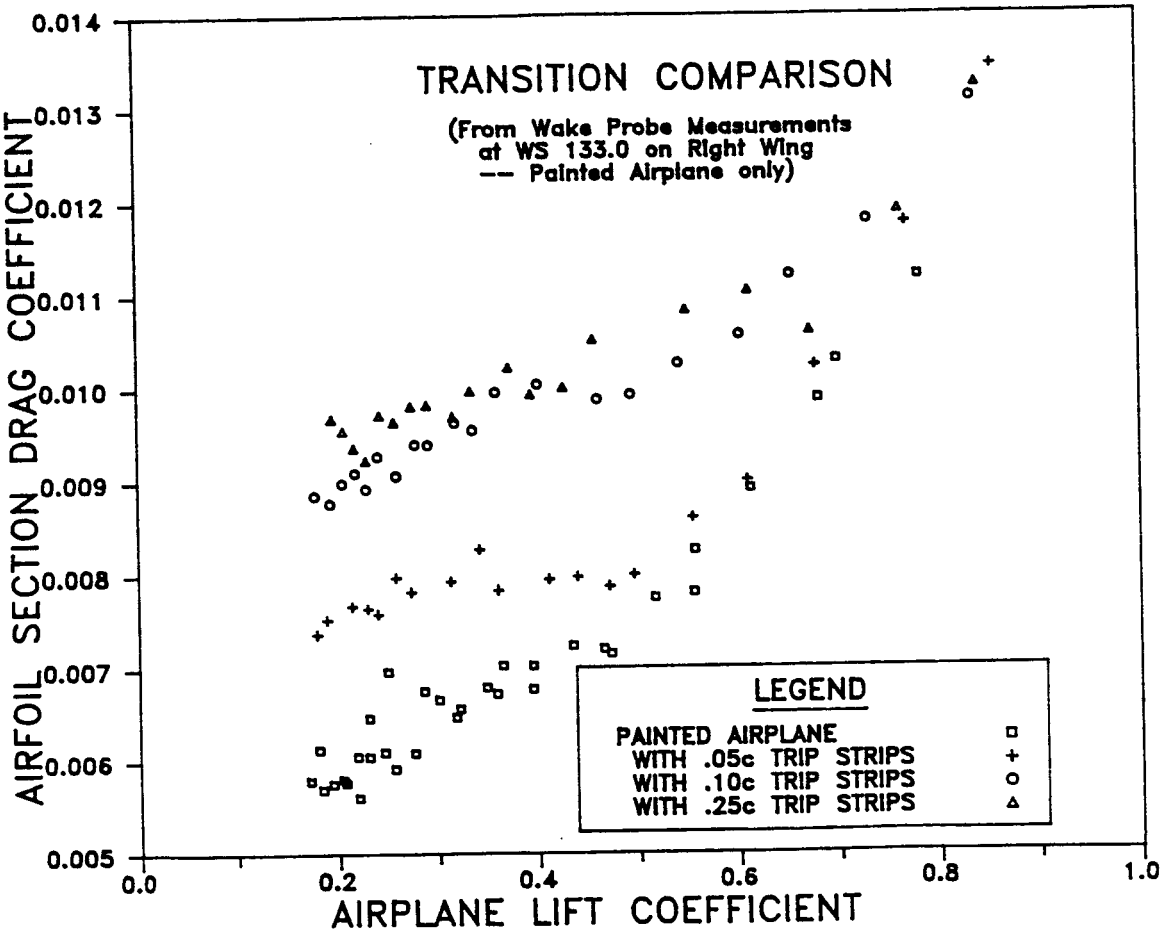

Fig. 8 Two-Dimensional Drag Coefficients--Fixed Transition

Fixed Transition. Fig. 8 shows the consistency of the two-dimensional measurements when trip strips were added. The wake probe technique clearly shows the changes in c_d associated with progressively rearward transition to a turbulent boundary layer. Table 3 summarizes the two-dimensional drag change at $C_L = 0.2$ for each trip strip location. Notice that the total change for the transition fixed at 25% chord is just under twice the change in c_d achieved by smoothing the wing surfaces. The measured values are also compared to two-dimensional drag coefficients computed with the Eppler-Somers code for this flight condition. In this case the computed c_d's are slightly optimistic compared to the measured ones. Notice that for the natural transition case, the computed c_d is only about 3.4% optimistic. The consistency of the drag increments and the reasonable correlation with Eppler-Somers estimations suggests that the two-dimensional measurements were the most accurate drag measurements of those made.

Table 3. Changes in Two-Dimensional Drag Coefficient at Cruise

Transition Location	Measured c_d	Calculated c_d
.05c	0.0097	0.0090
.10c	0.0090	0.0086
.25c	0.0075	0.0072
Free	0.0058	0.0056

CONCLUSIONS AND RECOMMENDATIONS

Flight test measurement of drag changes associated with three different surface conditions was completed satisfactorily using Jones' method of measuring the changes in total and static pressures across the wake. The following conclusions were drawn from these measurements.

1. Surface condition of the airfoil was an a very strong factor in reducing c_d. Apparently, how closely the design profile is maintained was the most important factor. Reductions in c_d of approximately 25% were attained by simply using a standard aircraft surface filler and sanding it carefully by hand to match the design airfoil as closely as could be measured with a template.

2. Painting the surfaces with the standard production finish had little effect on the two-dimensional drag coefficient. Apart from a region near an airplane $C_L = 0.2$, the painted surface showed a negligible increase in drag over the surface that was simply filled. Of course, high speed cruise near $C_L = 0.2$ is of considerable interest to operators. So the decrease in c_d associated with painting the featherfilled airfoil may be important, even though the change was only on the order of 7-10 drag counts.

3. Using transition strips to fix transition at known locations and verifying through flow visualization that transition was occurring at the chosen locations provided additional confidence in the wake measurement technique.

4. For a limited number of cases the agreement between measured c_d and c_d calculated from the Eppler-Somers computer code was good. The computed value for natural transition was less than 4% lower than the measured one at a high speed cruise flight condition.

This project reemphasized the difficulty of making precise drag measurements in flight. Even with painstaking attention to accuracy, either instrumentation problems or flight techniques (or both) made the speed power results inconsistent. The most troublesome measurement was the airplane efficiency factor, derived from the slope of the C_D versus C_L^2 curve. This slope varied in excess of 10% for no apparent change in configuration or surface condition. Moreover, the measured total drag coefficients using this approach gave changes in drag that were directly opposite to the two-dimensional drag coefficients measured using Jones' pitot traverse method. The speed power drag polars indicated that bringing the wing's airfoil closer to its design coordinates increased the overall C_D, not at all a believable result.

Based on these conclusions, the following recommendations are made.

1. Gains in performance due to extensive laminar flow, even for the older laminar flow airfoils, are achievable but only if airfoil contours are manufactured accurately. More research needs to be done to ascertain whether or not the additional cost is less with conventional aluminum structures or with advanced composites. Market conditions for

general aviation airplanes will then determine whether or not the additional expense is justified.

2. Flight test drag measurements should be made redundantly, with completely independent methods used to check their validity.

3. A flight test method is needed that is less time-consuming than either the speed power or the pitot traverse methods. Performance modeling methods offer some promise, but instrumentation requirements are usually prohibitive for small test organizations.

ACKNOWLEDGEMENTS

This research was supported by NASA Langley Research Grant NAG 1-309, Dr. Bruce Holmes, Technical Monitor; by the Texas Engineering Experiment Station, Texas A&M University System; and by the Mooney Aircraft Corporation.

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APPENDIX A

FLIGHT SUMMARY

FLIGHT SUMMARY

Flight No.	Date	Flight Objective/Configuration/Remarks	Hours
1	5-3-83	Instrumentation Checkout/ Torquemeter, Wing Rake, Angle of Attack Vane Installed on Boom Number 1	0.5
2	5-4-83	Speed Power/No Change	0.4
3	5-4-83	Airspeed Calibration/Video Camera Installed	0.5
4	5-5-83	Airspeed Calibration/No Change	1.0
5	5-5-83	Speed Power/Video Camera Removed	1.0
6	5-9-83	$C_L-\alpha$/No Change	1.5
7	5-19-83	Airspeed Calibration/Video Camera Installed	1.1
8	5-19-83	Speed Power and $C_L-\alpha$/Video Camera Removed	1.1
9	5-21-83	Wing Rake Survey/No Change	1.0
10	5-24-83	$C_L-\alpha$/No Change/Weather Abort	0.9
11	5-24-83	Sublimation (C_L = 0.2)/Torquemeter Removed	0.2
12	5-25-83	Sublimation (C_L = 0.2)/No Change	0.3
13	5-25-83	Sublimation (C_L = 0.4)/No Change	0.5
14	5-26-83	Sublimation (C_L = 0.3)/No Change	0.8
15	5-26-83	Sublimation (C_L = 0.2)/No Change	0.7
16	6-8-83	Wing Rake Survey/Video Camera Installed/ Abort for Instrumentaion	0.5
17	6-22-83	Wing Rake Survey/Video Camera Removed, Oscillograph and Inverter Installed, Magnetic Tape Installed	0.9
18	6-22-83	Instrumentation Checkout/No Change	0.7
19	6-22-83	Instrumentation Checkout/No Change	0.2
20	6-22-83	Instrumentation Checkout/No Change/ Gear Up Landing	0.1
21	7-7-83	Baseline Speed Power/New Engine Installed, Torquementer Installed, Gear Up Landing Damage Repaired, New Pitot Head Installed, New Rudder Installed	1.5
22	7-7-83	Wing Rake Survey (C_L = 0.2, 0.3, 0.4)/ No Change	1.1
23	7-12-83	Baseline Speed Power/No Change	0.8

Flight No.	Date	Flight Objective/Configuration/Remarks	Hours
24	7-19-83	Wing Rake Survey (C_L = 0.2, 0.3, 0.4)/ Instrumentation Checkout/Auxiliary Battery Installed for Oscillograph, Removed "T" Connection for Wake Δp	1.3
25	7-20-83	Wing Rake Survey (C_L = 0.2, 0.3, 0.4) Instrumentation Checkout/Wake Rake Δp Transducer Moved Halfway to Rake (Under Inverter Pallet)	0.8
26	7-21-83	Wing Rake Survey Instrumentation Checkout/No Change	0.9
27	7-21-83	Wing Rake Survey Instrumentation Checkout/No Change	0.5
28	7-22-83	Wing Rake Survey (C_L = 0.2, 0.3, 0.4)/ No Change	1.2
29	7-22-83	Wing Rake Survey (C_L = 0.2, 0.3, 0.35, 0.4)/No Change	0.8
30	7-25-83	Wing Rake Survey (C_L = 0.2, 0.3, 0.4)	0.8
31	7-26-83	Sublimation (C_L = 0.2, 10% Trip Strip, Masking Tape)/No Change	0.2
32	7-26-83	Sublimation (C_L = 0.3)/No Change	0.5
33	7-27-83	Sublimation (C_L = 0.3)/No Change	0.6
34	7-27-83	Sublimation (C_L = 0.4)/No Change	1.2
35	8-1-83	Sublimation (C_L = 0.2, 10% Trip Strip, Pinked Masking Tape, Upper and Lower)/ No Change	0.3
36	8-1-83	Sublimation (C_L = 0.2, 10% Trip Strip, Double Layer Masking Tape, Upper and Lower)/No Change	0.3
37	8-1-83	Sublimation (C_L = 0.2, 10% Trip Strip, Duct Tape, Upper and Lower)/No Change	0.3
38	8-1-83	Sublimation (C_L = 0.3, 10% Trip Strip, Duct Tape, Upper and Lower)/No Change	0.3
39	8-2-83	C_L-α and Wake Rake Survey (C_L = 0.2, 0.3, 0.4; 10% Trip Strip, Duct Tape, Upper and Lower)/No Change	1.3
40	8-3-83	Speed Power, C_L-α and Wake Rake Survey (C_L = 0.2, 0.3, 0.4; 10% Trip Strip, Duct Tape, Upper and Lower)/No Change	1.7

Flight No.	Date	Flight Objective/Configuration/Remarks	Hours
41	8-5-83	Sublimation (C_L = 0.3; 10% Trip Strip, Duct Tape, Upper and Lower)/No Change	0.6
42	8-8-83	Sublimation (C_L = 0.4; 10% Trip Strip, Duct Tape, Upper and Lower)/No Change	0.7
43	8-10-83	Speed Power and Wing Rake Survey, (10% Trip Strip, Duct Tape, Upper and Lower)/ Repaired Damaged Left Main Gear Door, Reset Right Main Gear Door	1.8
44	8-11-83	Speed Power (10% Trip Strip)/No Change	1.5
45	8-11-83	Speed Power (10% Trip Strip)/No Change	1.5
46	8-12-83	Speed Power (Baseline)/No Change	1.6
47	8-17-83	Wing Rake Survey	0.5
48	8-18-83	Wing Rake Survey (25% Trip Strips Upper and Lower)/No Change	1.3
49	8-19-83	Sublimation (C_L = 0.2, 25% Trip Strips Upper and Lower)/No Change	0.5
50	8-19-83	Sublimation (C_L = 0.3, 25% Trip Strips Upper and Lower)/No Change	0.4
51	8-19-83	Sublimation (C_L = 0.4, 25% Trip Strips Upper and Lower)/No Change	0.4
52	8-22-83	Speed Power and C_L-α, 25% Trip Strips Upper and Lower)/No Change	1.7
53	8-25-83	Speed Power and C_L-α, 25% Trip Strips Upper and Lower)/No Change	1.8
54	9-2-83	Wing Rake Survey (C_L = 0.2, 0.3, 0.4, 25% Trip Strips Upper and Lower)/No Change	0.6
55	9-2-83	Wing Rake Survey (C_L = 0.2, 0.3, 0.4, Baseline)/No Change	0.4
56	9-15-83	Wing Rake Survey (C_L = 0.2, 0.3, 0.4, Baseline)/No Change	1.0
57	9-23-83	Sublimation (C_L = 0.2, 5% Trip Strips Upper and Lower)/No Change	0.9
58	9-23-83	Speed Power, C_L-α and Wake Rake Survey, 5% Trip Strips Upper and Lower)/No Change	1.5
59	10-11-83	Pressure Belt, Wing Rake Survey (Instrumentation Checkout)	0.7
60	10-13-83	Pressure Belt, Wing Rake Survey (Instrumentation Checkout)	0.7

Flight No.	Date	Flight Objective/Configuration/Remarks	Hours
61	10-17-83	Pressure Belt, Wing Rake Survey (Instrumentation Checkout)	0.5
62	10-17-83	Pressure Belt, Wing Rake Survey (Instrumentation Checkout)	0.6
63	10-18-83	Pressure Belt, Wing Rake Survey	0.8
64	10-21-83	Pressure Belt, Wing Rake Survey	1.1
65	10-21-83	Pressure Belt	0.7
66	10-24-83	Pressure Belt	0.7
67	1-4-84	Pressure Belt with Larger Diameter Tubes Installed, Oscillograph and Inverter Removed, Scannivalve Installed, Compudas Installed, New Engine (Instrumentation Checkout)	0.9
68	1-5-84	Wing Rake Survey, Pressure Belt (C_L = 0.2, 0.25, 0.3, 0.35)	1.3
69	1-23-84	Wing Rake Survey, Pressure Belt, Abort (First Flight after 100-hour Inspection)	0.5
70	1-24-84	Wing Rake Survey, Pressure Belt	1.0
71	1-27-84	Wing Rake Survey, Pressure Belt, Speed Power	1.8
72	2-13-84	Wing Rake Survey, Pressure Belt, Speed Power, $C_L-\alpha$	2.0
73	2-14-84	Speed Power (Abort for Weather)	0.7
74	2-16-84	Speed Power	1.5
75	2-21-84	Speed Power, Wake Rake, Pressure Belt Tubes Cut at TE/TE Extension Removed	1.7
76	3-2-84	Speed Power, Wake Rake, Pressure Belt Removed	1.7
77	3-8-84	Speed Power, Wake Rake, Cleaned Bottom of Wing	2.0
78	3-19-84	Abort Due to Weather, Reset Right Gear Door and Right Cowl Flap	1.0
79	3-20-84	Speed Power, Wake Rake	2.0
80	3-21-84	Speed Power	1.1
81	3-27-84	Speed Power, Wake Rake, Abort Due to Weather, Removed Tape and Pressure Belt Wires from TE of Wing, Recalibrated ASI, Recalibrated Torquemeter, Pitot-Static Check Completed	0.6

Flight No.	Date	Flight Objective/Configuration/Remarks	Hours
82	3-28-84	Speed Power, Wake Rake	2.7
83	3-29-84	Speed Power	1.1
84	3-30-84	Wing Rake Survey, 0.05c Trip Strip on Right Wing Only	1.1
85	3-30-84	Wing Rake Survey, 0.10c Trip Strip on Right Wing Only	1.3
86	3-30-84	Wing Rake Survey, 0.25c Trip Strip on Right Wing Only	0.9
87	5-25-84	Sublimation, Clean (No Trip Strip), C_L = 0.2, Wings Featherfilled, Wing Rake Installed	0.3
88	5-25-84	Sublimation, Clean (No Trip Strip), C_L = 0.2, Wings Featherfilled, Wing Rake	0.2
89	5-25-84	Wake Rake, $C_L-\alpha$	2.0
90	5-29-84	Sublimation, Clean (No Trip Strip), C_L = 0.2, Wings Featherfilled, Wing Rake	0.5
91	5-29-84	Speed Power, Prop Sanded	1.3
92	5-30-84	Speed Power	1.4
93	6-15-84	Speed Power	1.6
94	6-25-84	Sublimation, Clean (No Trip Strip), C_L = 0.2, Wings Featherfilled, Wing Rake	0.3
95	6-25-84	Sublimation, Clean (No Trip Strip), C_L = 0.3, Wings Featherfilled, Wing Rake Abort (too hot)	0.3
96	6-26-84	Sublimation, Clean (No Trip Strip), C_L = 0.3, Wings Featherfilled, Wing Rake	0.4
97	6-26-84	Sublimation, Clean (No Trip Strip), C_L = 0.3, Wings Featherfilled, Wing Rake Bottom of Wing	0.2
98	6-26-84	Sublimation, Clean (No Trip Strip), C_L = 0.3, Wings Featherfilled, Wing Rake Bottom of Wing	0.3
99	6-27-84	Sublimation, Clean (No Trip Strip), C_L = 0.3, Wings Featherfilled, Wing Rake Bottom of Wing	0.4
100	6-27-84	Sublimation, Clean (No Trip Strip), C_L = 0.4, Wings Featherfilled, Wing Rake	0.5
101	6-27-84	Sublimation, Clean (No Trip Strip), C_L = 0.4, Wings Featherfilled, Wing Rake	0.4

Flight No.	Date	Flight Objective/Configuration/Remarks	Hours
102	6-29-84	Sublimation, Clean (No Trip Strip), C_L = 0.2, Wings Featherfilled, Wing Rake	0.5
103	6-29-84	Sublimation, 0.05c Trip Strip (Double Layer of Duct Tape), C_L = 0.2, Wings Featherfilled, Wing Rake	0.4
104	7-2-84	Speed Power, 0.05c Trip Strip (Double Layer of Duct Tape), C_L = 0.2, Wings Featherfilled, Wing Rake, Abort Due to Weather	0.5
105	7-3-84	Speed Power, 0.05c Trip Strip (Double Layer of Duct Tape), C_L = 0.2, Wings Featherfilled, Wing Rake, $C_L-\alpha$	2.2
106	7-5-84	Sublimation, 0.05c Trip Strip (Single Layer of Duct Tape), C_L = 0.2, Wings Featherfilled, Wing Rake	0.2
107	7-6-84	Sublimation, 0.05c Trip Strip (Single Layer of Duct Tape), C_L = 0.2, Wings Featherfilled, Wing Rake	0.2
108	7-6-84	Speed Power, 0.05c Trip Strip (Single Layer of Duct Tape), C_L = 0.2, Wings Featherfilled, Wing Rake	1.2
109	7-9-84	Speed Power, 0.05c Trip Strip (Single Layer of Duct Tape), C_L = 0.2, Wings Featherfilled, Wing Rake, $C_L-\alpha$	1.8
110	7-10-84	Speed Power, 0.10c Trip Strip (Single Layer of Duct Tape), C_L = 0.2, Wings Featherfilled, Wing Rake, $C_L-\alpha$	1.7
111	7-10-84	Speed Power, 0.05c Trip Strip (Single Layer of Duct Tape), C_L = 0.2, Wings Featherfilled, Wing Rake, $C_L-\alpha$	1.2
112	7-11-84	Speed Power, 0.25c Trip Strip (Single Layer of Duct Tape), C_L = 0.2, Wings Featherfilled, Wing Rake, $C_L-\alpha$, Abort Due to Tape Strip	0.5
113	7-11-84	Speed Power, 0.05c Trip Strip (Single Layer of Duct Tape), C_L = 0.2, Wings Featherfilled, Wing Rake, $C_L-\alpha$	1.5
114	7-12-84	Speed Power, 0.05c Trip Strip (Single Layer of Duct Tape), Wings Featherfilled	1.1

Flight No.	Date	Flight Objective/Configuration/Remarks	Hours
115	7-12-84	Speed Power, 0.05c Trip Strip (Single Layer of Duct Tape), Wings Featherfilled	1.2
116	10-19-84	Sublimation, No Trip Strip, C_L = 0.3, Wings Featherfilled, Wing Rake	0.4
117	10-19-84	Oil Film, No Trip Strip, C_L = 0.3 and 0.4, Wings Featherfilled, Wing Rake	0.4
118	10-19-84	Oil Film, No Trip Strip, C_L = 0.2 and 0.3, Wings Featherfilled, Wing Rake	0.3
119	10-19-84	Oil Film, No Trip Strip, C_L = 0.2, 0.3, and 0.4, Wings Featherfilled, Wing Rake	0.4
120	10-30-84	Oil Film, No Trip Strip, C_L = 0.2, 0.3, and 0.4, Wings Featherfilled, Wing Rake	0.8
121	10-30-84	Oil Film, No Trip Strip, C_L = 0.2, 0.3, and 0.4, Wings Featherfilled, Wing Rake	0.9
122	11-5-84	Speed Power, No Trip Strip, Wings Featherfilled, Wake Rake	1.5
123	11-5-84	Speed Power, No Trip Strip, Wings Featherfilled, Wake Rake	1.0
124	11-6-84	Speed Power, No Trip Strip, Wings Featherfilled, Wake Rake	1.5
125	11-6-84	Oil Film, No Trip Strip, C_L = 0.2, 0.3, and 0.4, Wings Featherfilled, Wing Rake, Torquemeter Removed	0.6
126	11-9-84	Oil Film, No Trip Strip, C_L = 0.2, 0.3, and 0.4, Wings Featherfilled, Wing Rake,	0.5
127	11-12-84	Oil Film, No Trip Strip, C_L = 0.2, 0.3, and 0.4, Wings Featherfilled, Wing Rake,	0.6
128	1-17-85	Wing Rake, No Trip Strip, Wings Featherfilled, Recalibrated ASI, Removed 200# Ballast, Reweigh	1.5
129	1-17-85	Wing Rake, 0.05c Trip Strip (Right Wing only), Wings Featherfilled	1.4
130	1-18-85	Wing Rake, 0.10c Trip Strip (Right Wing only), Wings Featherfilled	1.4
131	1-18-85	Wing Rake, 0.25c Trip Strip (Right Wing only), Wings Featherfilled	1.6
132	4-3-85	Speed Power, Wing Rake, Aircraft Painted with Production Paint Job, Torquemeter, Wing Rake and Boom Reinstalled	2.1

Flight No.	Date	Flight Objective/Configuration/Remarks	Hours
133	4-4-85	Speed Power	1.5
134	4-9-85	Sublimation (Upper Wing), C_L = 0.2	0.4
135	4-9-85	Sublimation (Lower Wing), C_L = 0.2	0.3
136	4-11-85	Sublimation (Upper Wing), C_L = 0.2	0.3
137	4-15-85	Speed Power, Wing Rake	2.3
138	4-16-85	Speed Power, Wing Rake, 0.05c Trip Strip	2.2
139	4-17-85	Speed Power, Wing Rake, 0.10c Trip Strip	2.3
140	4-18-85	Speed Power, Wing Rake, 0.25c Trip Strip	2.5
141	4-23-85	Sublimation, No Trip Strips, C_L = 0.2	0.4
142	4-23-85	Oil Film, No Trip Strips, C_L = 0.2 & 0.4	0.5
143	4-23-85	Oil Film, No Trip Strips, C_L = 0.3	0.3
144	5-9-85	Sublimation, No Trip Strips, C_L = 0.2	0.3
145	5-14-85	Sublimation, No Trip Strips, C_L = 0.2	0.3
146	5-16-85	Sublimation & Oil Film, No Trip Strips, C_L = 0.2	0.7
147	5-16-85	Oil Film, No Trip Strips, C_L = 0.2	0.5
148	5-17-85	Sublimation, No Trip Strips, C_L = 0.2	0.5
		Total Flying Hours	**139.5**

APPENDIX B

WAKE PRESSURE DATA

WAKE PRESSURE DATA

The following computer-generated data summarize wake rake measurements made on the left wing at WS 133.00. They were provided by Mooney Aircraft along with data diskettes where the pressure data were reduced and plotted for individual runs on specific flights. These tabulations are included for completeness and to allow interested readers to duplicate the results summarized in the body of the the report.

The two-dimensional drag at this location on the wing was calculated from each of the runs and the tabular data summaries show the calculated coefficients. The data diskettes provided with this report give the spread sheets that were provided by Mooney. Personnel at Texas A&M University recalculated (utilizing the method described by Jones[7]) these two-dimensional drag coefficients using static pressure measured in the wake as a reference pressure rather than the freestream static pressure measured at the test boom as utilized by Mooney. The differences between these two calculations were small, on the order of 4-10 drag counts, with the larger values occurring at higher angles of attack. This difference did affect the repeatability of the measured drag coefficients slightly; so, as noted in the body of the report, only data using the boom-measured static pressure as a reference were discussed.

Also, no data from wake surveys made before Flight 82 are included since the instrumentation did not function properly until this flight and later. The flight summaries in Appendix A concisely summarize the changes that were made. The wake survey equipment actually became functional on flights 67, but the data taken on Flights 67 through 81 were all with pressure belts on the wing at the station of interest. Consequently, the two-dimensional drag coefficients measured on these flights were not applicable for the purposes of this project. These data are included on the data diskettes furnished with this report, but are not summarized in this Appendix.

NASA NLF PROJECT
WAKE C_d DATA SUMMARY

(reference static pressure: test boom)

RESULT SUMMARY
========== (Bare-Metal Wing, no Tripper Strip) -- Flt. 82 --

C_L	c_d(ref)		c_d					
0.18	0.00726	(107)	0.00742	(329)	0.00748	(458)	0.00651	(684)
0.19	.....		.....		.....		.....	
0.2	0.00734	(94)	0.00714	(298)	0.00704	(475)	0.00736	(677)
0.22	0.00769	(90)	0.00774	(295)	0.00725	(451)	0.00761	(657)
0.23	0.00754	(92)	0.00735	(295)	0.00758	(492)	0.00764	(692)
0.25	0.00764	(84)	0.00751	(282)	0.00777	(461)	0.00757	(655)
0.26	.....		.....		.....		.....	
0.27	.....		.....		.....		.....	
0.3	0.00789	(84)	0.00786	(276)	0.00784	(451)	0.00773	(642)
0.31	.....		.....		.....		.....	
0.34	.....		.....		.....		.....	
0.35	0.00815	(80)	0.00783	(265)	0.00799	(447)	0.00812	(634)
0.39	0.00853	(80)	0.00769	(265)	0.00812	(438)	0.00899	(642)
0.42	.....		.....		.....		.....	
0.45	0.009	(79)	0.00848	(271)	0.0089	(443)	0.00953	(619)
0.51	0.00948	(81)	0.00881	(276)	0.0086	(459)	0.00931	(644)
0.54	0.00891	(109)	0.00958	(304)	0.00931	(498)	0.00856	(672)
0.59	0.00942	(77)	0.00916	(272)	0.00915	(467)	0.00967	(655)
0.67	0.01025	(79)	0.00979	(274)	0.01039	(463)	0.01021	(653)
0.72	0.01074	(81)	0.01061	(276)	0.01082	(471)	0.01061	(668)
0.8	0.01189	(77)	0.01242	(252)	0.01178	(451)	0.01218	(640)

RESULT SUMMARY
========== (Bare-Metal Wing, 5% Tripper Strip) -- Flt. 84 --

C_L	c_d(ref)		c_d					
0.2	0.00937	(71)	0.00916	(265)	0.00892	(448)	0.00913	(676)
0.22	0.00929	(81)	0.00937	(279)	0.00935	(417)	0.00936	(606)
0.25	0.00934	(80)	0.00954	(274)	0.0095	(454)	0.00881	(642)
0.3	0.00941	(83)	0.00997	(276)	0.00912	(451)	0.00932	(644)
0.35	0.00953	(84)	0.00974	(279)	0.00903	(472)	0.00957	(664)
0.4	0.00996	(79)	0.00981	(270)	.....		0.00988	(639)
0.45	0.00947	(78)	0.00985	(268)	0.01018	(449)	.....	
0.47	0.01015	(79)	0.01062	(270)	0.01021	(472)	0.00927	(665)
0.5	0.00997	(79)	0.01032	(265)	0.00998	(441)	.....	
0.55	0.011	(84)	0.01116	(281)	0.01085	(467)	0.01122	(657)
0.6	.....		0.00994	(260)	0.01051	(439)	0.0118	(639)
0.65	0.01064	(79)	0.01077	(276)	0.0109	(468)	.....	
0.7	.....		0.01127	(257)	.....		0.01111	(625)
0.75	0.01227	(78)	0.01246	(268)	.....		0.01147	(622)
0.8	0.01372	(70)	0.01201	(270)	0.0124	(444)	.....	

RESULT SUMMARY
========== (Bare-Metal Wing, 10% Tripper Strip)-- Flt. 85 --

C_L	c_d(ref)		c_d					
0.2	0.0086	(84)	.....		0.00898	(442)	0.00879	(629)
0.22	0.00885	(82)	0.00843	(267)	.....		0.00902	(657)
0.25	0.00907	(81)	0.00883	(272)	0.00871	(435)	0.00871	(625)
0.3	.....		0.0088	(267)	0.009	(450)	0.00863	(640)
0.35	0.00921	(79)	0.00935	(264)	0.00909	(441)	0.00935	(623)
0.4	0.00945	(79)	0.0092	(264)	0.00939	(448)	0.00946	(637)
0.45	0.00986	(77)	0.00971	(273)	0.00929	(449)	0.00918	(638)
0.5	0.00987	(78)	.....		0.00924	(464)	0.01017	(657)
0.55	0.01026	(78)	0.01024	(293)	0.01048	(483)	0.01007	(671)
0.6	0.01126	(81)	0.01072	(274)	.....		0.01055	(652)
0.65	0.01076	(82)	0.01073	(271)	0.0109	(459)	0.01035	(657)
0.75	0.0119	(65)	0.01137	(265)	0.01156	(444)	.....	
0.8	.....		0.01336	(274)	0.01218	(463)	0.01282	(668)

RESULT SUMMARY
========== (Bare-Metal Wing, 25% Tripper Strip)-- Flt. 86 --

C_L	c_d(ref)		c_d					
0.20	0.00840	(85)	.....		0.0089	(442)	0.00853	(630)
0.25	0.00755	(80)	0.00777	(260)	0.00777	(434)	0.00819	(613)
0.30	0.00824	(78)	0.00821	(264)	0.00792	(425)	0.00757	(603)
0.35	0.00799	(79)	0.00829	(257)	0.00829	(420)	0.00792	(621)
0.40	0.00778	(80)	0.00845	(271)	0.00760	(469)	0.00822	(658)
0.45	0.00840	(86)	0.00874	(270)	0.00849	(458)	0.00853	(644)
0.50	0.00827	(77)	0.00889	(268)	0.00888	(458)	.....	
0.55	0.00835	(80)	.....		0.00872	(470)	0.00854	(666)
0.60	0.00901	(80)	0.00924	(279)	.....	.....		
0.65	0.01010	(88)	.....		0.00926	(468)	0.01036	(667)
0.70	0.01062	(79)	.....		0.00976	(464)	0.01002	(660)
0.75	0.01121	(73)	0.01192	(279)	0.01152	(470)	0.01217	(676)
0.80	0.01151	(77)	0.01276	(278)	.....		0.01143	(667)

RESULT SUMMARY
========== (Feather Fill, No Tripper Strip) -- Flt. 89 --

C_L	c_d(ref)		c_d					
0.182	.....		0.00592	(282)	0.00588	(467)	0.00608	(648)
0.194	.....		.....		.....	.....		
0.207	0.00577	(79)	0.00576	(260)	0.00583	(427)	0.006	(610)
0.212	.....		.....		.....		.....	
0.233	0.00572	(70)	0.00597	(259)	0.00592	(433)	0.00587	(617)
0.25	0.00607	(81)	0.00604	(211)	.....	.....		
0.262	.....		.....		.....	.....		
0.281	0.00666	(88)	0.00618	(268)	0.00619	(446)	0.00619	(625)
0.3	0.00633	(80)	0.00647	(268)	0.00632	(403)	0.00646	(643)
0.331	0.0062	(77)	0.00613	(261)	0.00641	(457)	0.0062	(636)
0.347	.....		0.00691	(256)	0.00617	(412)	0.00622	(593)
0.372	0.00676	(92)	0.00694	(280)	.....		0.00665	(631)
0.395	0.00689	(80)	0.00617	(268)	.....		0.0073	(625)
0.424	0.00745	(77)	0.00725	(260)	0.00723	(430)	0.00734	(654)
0.465	0.00735	(70)	0.0078	(250)	0.00721	(411)	0.00749	(600)
0.511	0.0072	(70)	0.0076	(268)	0.00768	(422)	0.00762	(616)
0.543	0.00716	(68)	0.00749	(246)	0.00741	(405)	0.00798	(588)
0.607	0.0083	(76)	0.00879	(265)	0.00858	(424)	0.00825	(617)
0.67	0.00924	(64)	0.00928	(254)	0.00999	(416)	0.0095	(615)
0.745	0.01073	(74)	0.01065	(264)	0.01149	(421)	0.01016	(623)
0.827	0.01211	(84)	0.01287	(280)	0.012	(432)	0.01291	(628)

RESULT SUMMARY
========== (Feather Fill, 5% Tripper Strip) -- Flt. 109 --

C_L	c_d(ref)		c_d					
0.191	0.00965	(94)	0.00943	(288)	0.00951	(462)	0.0093	(663)
0.207	0.00944	(79)	0.00927	(275)	0.00954	(445)	.....	
0.216	.....		.....		0.00965	(443)	.....	
0.236	.....		0.00938	(263)	0.00977	(421)	0.00942	(614)
0.248	0.00949	(89)	0.00966	(298)	0.00968	(468)	0.00956	(667)
0.261	0.00962	(82)	0.00945	(280)	.....		0.00924	(649)
0.27	0.00982	(78)	0.0096	(282)	0.0093	(448)	0.00953	(645)
0.292	0.00988	(76)	0.00985	(269)	0.00969	(435)	.....	
0.315	0.01024	(74)	0.00966	(271)	0.00993	(447)	.....	
0.348	.....		0.00947	(276)	0.01006	(440)	0.00992	(640)
0.361	0.00993	(75)	.....		.....		0.01012	(663)
0.401	0.01029	(80)	0.01055	(267)	0.0105	(426)	0.0102	(623)
0.42	.....		0.01005	(263)	0.01045	(432)	0.0105	(630)
0.454	0.01034	(75)	.....		.....		0.01052	(632)
0.502	0.0104	(98)	0.01065	(290)	0.01047	(443)	0.01055	(594)
0.551	0.01074	(59)	0.01079	(252)	0.01092	(403)	0.01083	(594)
0.619	0.01098	(68)	0.01096	(253)	0.01076	(412)	0.01208	(605)
0.603	0.01121	(68)	0.01121	(257)	0.0108	(413)	0.01113	(605)
0.737	0.01243	(64)	0.01161	(262)	0.01184	(426)	0.01182	(621)
0.81	0.01351	(63)	0.0135	(256)	0.01343	(407)	0.01259	(611)

RESULT SUMMARY
========== (Feather Fill, 10% Tripper Strip) -- Flt. 110 --

C_L	c_d(ref)		c_d					
0.193	0.00864	(61)	0.00847	(257)	0.00884	(428)	0.0086	(629)
0.207	0.00911	(85)	0.00877	(271)	0.00932	(442)	0.00901	(641)
0.215	0.00913	(72)	0.00928	(271)	0.009	(441)	0.00934	(642)
0.23	0.00905	(75)	0.00899	(273)	0.00921	(435)	0.00869	(645)
0.251	0.0089	(85)	.....		0.00942	(451)	0.00942	(648)
0.267	0.00915	(74)	0.00881	(272)	0.00896	(436)	0.00903	(634)
0.29	0.00913	(72)	0.00921	(270)	0.00941	(442)	0.00926	(642)
0.3	0.00935	(73)	0.00927	(272)	0.00932	(445)	.....	
0.316	0.00938	(80)	0.00966	(266)	0.00955	(433)	0.0095	(627)
0.353	.....		0.00925	(303)	0.00931	(515)	.....	
0.365	0.0099	(76)	0.00916	(267)	0.00942	(433)	0.00938	(626)
0.407	0.00963	(73)	0.0095	(275)	0.00956	(437)	0.00961	(644)
0.436	0.00957	(72)	0.01013	(268)	0.00953	(438)	.....	
0.461	0.00987	(67)	0.00944	(255)	0.00953	(420)	0.00968	(613)
0.505	0.00969	(66)	0.00989	(261)	0.01004	(422)	0.01009	(612)
0.554	.....		.....		0.01024	(441)	0.01093	(612)
0.61	0.01004	(63)	0.01079	(252)	0.01066	(409)	0.01072	(606)
0.675	.....		.....		.....		.....	
0.741	0.01157	(65)	0.01127	(264)	0.01173	(421)	0.01147	(647)
0.822	0.01276	(49)	.....		.....		0.01302	(600)

RESULT SUMMARY
========== (Feather Fill, 25% Tripper Strip) -- Flt. 113 --

C_L	c_d(ref)		c_d					
0.185	0.00777	(58)	0.00756	(277)	0.00772	(497)	.....	
0.197	0.0074	(76)	0.00722	(271)	0.00762	(445)	0.00734	(645)
0.204	0.00802	(79)	0.00738	(270)	.....		0.00786	(651)
0.212	0.0078	(65)	0.0076	(263)	0.00757	(432)	0.00784	(633)
0.225	0.00758	(73)	0.00717	(272)	0.00775	(464)	0.00737	(660)
0.238	.....		0.00731	(279)	0.00743	(446)	0.00738	(650)
0.256	0.00795	(80)	0.00729	(273)	0.00742	(447)	0.00737	(646)
0.277	0.00802	(88)	0.00741	(289)	0.00751	(466)	.....	
0.292	.....		0.0072	(270)	0.00723	(444)	0.00746	(648)
0.316	0.00708	(75)	0.00754	(264)	0.00741	(426)	0.0075	(620)
0.334	0.00741	(84)	0.00763	(283)	0.00774	(456)	0.00767	(656)
0.369	.....		0.00751	(262)	0.00766	(434)	0.00736	(635)
0.395	0.00746	(75)	0.00703	(271)	0.00791	(484)	0.00756	(682)
0.417	0.00797	(66)	0.00768	(268)	0.00761	(445)	0.00783	(636)
0.459	0.0087	(66)	0.00859	(266)	0.0086	(446)	0.00854	(636)
0.49	0.00828	(75)	0.00826	(273)	.....		0.00827	(666)
0.547	0.0092	(74)	.....		0.00928	(455)	0.00873	(666)
0.601	0.00919	(69)	0.00952	(273)	0.00942	(444)	0.00955	(641)
0.658	0.00967	(67)	0.01035	(270)	0.00984	(455)	0.00991	(658)
0.714	0.01144	(66)	0.0117	(266)	0.01171	(428)	.....	
0.795	0.01317	(67)	0.01275	(269)	0.01236	(432)	0.01241	(641)

RESULT SUMMARY

========== (Feather Fill, No Tripper Strip) -- Flt. 128 --

C_L	c_d(ref)		c_d					
0.157	0.00674	(119)	0.00648	(414)	0.00685	(661)	.....	
0.167	0.00647	(400)	0.00667	(628)	.....		.....	
0.173	0.00672	(128)	0.00687	(609)	0.00662	(387)	0.00646	(860)
0.183	0.0067	(680)	0.00629	(440)	0.00688	(132)	.....	
0.194	0.00678	(126)	0.007	(392)	.....		.....	
0.207	0.00667	(414)	0.00658	(639)	.....		.....	
0.216	0.00686	(377)	0.00694	(131)	0.00647	(822)	.....	
0.234	0.00627	(675)	0.00623	(442)	.....		.....	
0.246	0.00606	(120)	0.00604	(355)	0.0062	(634)	.....	
0.258	0.00582	(378)	0.00582	(102)	0.00618	(632)	.....	
0.281	0.00614	(127)	0.00603	(394)	.....		.....	
0.297	0.00575	(667)	0.00555	(404)	0.0599	(134)	.....	
0.32	0.00628	(147)	0.00629	(430)	0.0604	(656)	.....	
0.339	0.00621	(383)	0.00611	(128)	.....		.....	
0.372	0.00633	(581)	0.00645	(135)	0.00612	(393)	.....	
0.406	0.00649	(125)	0.00702	(423)	0.00666	(685)	.....	
0.461	0.00679	(127)	0.00663	(663)	.....	.....		
0.522	0.00747	(425)	0.00755	(665)	.....	.....		
0.557	0.00776	(621)	0.00796	(117)	.....	.....		
0.619	0.00897	(122)	0.00921	(637)	.....	.....		
0.696	0.00945	(468)	0.00978	(718)	.....	.....		
0.778	0.01107	(399)	0.01089	(118)	.....	.....		

RESULT SUMMARY

========== (Feather Fill, 5% Tripper Strip) -- Flt. 129 --

C_L	c_d(ref)		c_d					
0.155	0.00902	(840)	0.00876	(610)	0.0088	(377)	0.00922	(110)
0.166	0.00899	(389)	0.00907	(126)	.....		.....	
0.175	0.00921	(132)	0.00906	(394)	0.00922	(617)	.....	
0.185	0.00908	(829)	0.00913	(372)	0.00924	(122)	.....	
0.196	0.00919	(590)	0.0091	(842)	0.00911	(377)	0.00922	(122)
0.206	0.00904	(392)	0.00903	(124)	0.00935	(598)	0.00924	(859)
0.218	0.0086	(130)	0.00918	(401)	0.00832	(624)	.....	
0.231	0.00919	(804)	0.00934	(568)	0.00894	(365)	0.00957	(121)
0.247	0.00941	(831)	0.00961	(572)	0.0094	(356)	0.00945	(104)
0.263	0.00905	(370)	0.0101	(121)	0.00936	(571)	0.00877	(807)
0.281	0.00924	(119)	0.00951	(822)	0.00941	(553)	.....	
0.305	0.00913	(546)	0.00895	(361)	0.0096	(797)	.....	
0.322	0.00949	(367)	0.00941	(120)	0.00961	(570)	0.0091	802)
0.346	0.00951	(839)	0.00996	(604)	0.00935	(384)	0.0095	111)
0.376	0.00964	(559)	0.00987	(799)	0.00933	(366)	0.00974	(107)
0.399	0.00966	(363)	0.00987	(568)	0.00982	(799)	.....	
0.431	0.01002	(384)	0.0106	(130)	0.01014	(577)	0.00997	(813)
0.476	0.01027	(771)	0.01003	(547)	0.01014	(359)	0.01017	(119)
0.525	0.01049	(800)	0.01038	(377)	0.01115	(118)	.....	
0.564	0.01125	(113)	0.01017	(360)	0.0102	(825)	.....	
0.616	0.01116	(388)	0.01043	(105)	0.01167	(609)	.....	
0.713	0.01145	(836)	0.01134	(594)	0.0113	(363)	.....	
0.773	0.01213	(573)	0.0123	(818)	0.0118	(373)	0.01072	(116)
0.85	0.01296	(342)	0.01296	(108)	0.0137	(562)	0.01352	(812)

RESULT SUMMARY

(Feather Fill, 10% Tripper Strip) -- Flt. 130 --

C_L	c_d(ref)		c_d					
0.151	0.00872	(374)	0.00846	(102)	0.00891	(615)	.....	
0.166	0.00864	(818)	0.00859	(575)	0.00882	(364)	0.00856	(119)
0.175	0.00863	(598)	0.00848	(382)	0.00902	(115)	0.00843	(843)
0.183	0.00870	(593)	0.00875	(841)	0.00857	(368)	0.00875	(114)
0.195	0.00861	(111)	0.00856	(374)	0.00843	(624)	0.00871	(859)
0.208	0.00898	(827)	.....		0.00884	(373)	0.00896	(113)
0.218	0.00911	(113)	0.00911	(363)	0.00896	(576)	0.00948	(832)
0.232	0.00887	(363)	0.00918	(115)	0.00890	(588)	0.00863	(849)
0.247	0.00908	(107)	0.00901	(319)	0.00939	(518)	0.00891	(750)
0.264	0.00891	(357)	0.00898	(105)	0.00909	(557)	0.00863	(802)
0.300	0.00878	(581)	0.00881	(836)	0.00845	(363)	0.009	(107)
0.327	0.00920	(110)	0.00922	(439)	0.00919	(656)	.....	
0.346	0.00914	(110)	0.00872	(374)	0.00936	(603)	0.00909	(858)
0.370	0.00946	(330)	0.00952	(107)	0.00973	(536)	0.00915	(778)
0.402	0.00938	(105)	0.00924	(376)	0.00980	(646)	.....	
0.432	0.00955	(112)	0.00971	(358)	0.00990	(573)	.....	
0.477	0.00973	(417)	0.01001	(118)	.....		.....	
0.521	0.00985	(779)	0.01022	(557)	0.00976	(332)	0.01024	(106)
0.566	0.01034	(419)	0.01036	(105)	0.01036	(637)	.....	
0.701	0.01099	(102)	0.01105	(486)	0.01071	(696)	.....	
0.783	0.01262	(100)	0.01185	(536)	0.01240	(768)	.....	
0.884	0.01364	(544)	0.01360	(797)	0.01370	(350)	.....	

RESULT SUMMARY
========== (Feather Fill, 25% Tripper Strip) -- Flt. 131 --

C_L	c_d(ref)		c_d					
0.172	0.00768	(525)	0.00733	(753)	0.00782	(106)	.....	
0.183	0.00746	(593)	0.00751	(824)	0.00728	(109)	.....	
0.194	0.00746	(577)	0.00756	(830)	0.00733	(104)	.....	
0.203	0.0075	(111)	0.00829	(596)	.....		.....	
0.215	0.00758	(108)	0.00779	(517)	0.00744	(753)	.....	
0.228	0.0077	(799)	0.00741	(556)	0.00774	(104)	.....	
0.244	0.00713	(567)	0.00763	(835)	0.0072	(108)	.....	
0.264	0.00748	(109)	0.00753	(529)	0.00747	(761)	.....	
0.278	0.00765	(107)	0.00772	(649)	.....		.....	
0.295	0.00751	(408)	0.00746	(652)	0.00773	(111)	.....	
0.316	0.00734	(376)	0.00761	(631)	0.00718	(112)	.....	
0.341	0.00769	(114)	0.00797	(375)	0.00741	(625)	.....	
0.372	0.00749	(769)	0.00782	(113)	.....		.....	
0.396	0.00731	(387)	0.00723	(107)	.....		.....	
0.44	0.00752	(115)	0.00752	(345)	0.00683	(580)	.....	
0.47	0.00762	(375)	0.00731	(617)	0.00784	(112)	.....	
0.513	0.0079	(376)	0.0079	(811)	0.00785	(111)	.....	
0.557	0.00855	(113)	0.0085	(338)	.....		.....	
0.632	0.00919	(369)	0.00954	(110)	0.00896	(588)	0.00906	(83)
0.678	0.0103	(818)	0.00998	(554)	0.01049	(360)	0.00991	(114)
0.761	0.01099	(361)	0.01101	(116)	0.01011	(570)	0.01157	(808)
0.868	0.01359	(595)	0.01365	(364)	0.0132	(110)	.....	

RESULT SUMMARY
========== (Feather and Paint, No Tripper Strip-- Flt. 132 --

C_L	c_d(ref)		c_d					
0.181	0.00613	(539)	0.00608	(780)	0.00609	(319)	0.00622	(98)
0.194	0.00581	(799)	0.00615	(564)	0.00581	(112)	.....	
0.207	0.00585	(111)	0.00557	(370)	0.0059	(809)	.....	
0.22	0.00572	(62)	0.0055	(380)	.....		.....	
0.231	0.00599	(633)	0.00609	(114)	.....		.....	
0.246	0.00608	(112)	0.00619	(366)	0.00598	(581)	0.00611	(845)
0.256	0.00586	(844)	0.00573	(576)	0.00581	(359)	0.00623	(110)
0.276	0.00608	(379)	0.00614	(102)	0.00629	(591)	0.00581	(849)
0.318	0.00646	(104)	0.00644	(357)	0.00647	(566)	0.00646	(820)
0.359	0.00652	(367)	0.00712	(107)	0.00635	(832)	0.00681	(580)
0.395	0.00688	(777)	0.00649	(545)	0.00687	(103)	.....	
0.435	0.00716	(126)	0.00714	(398)	0.00737	(591)	0.00715	(791)
0.473	0.00717	(362)	0.00718	(111)	0.00707	(564)	0.00704	(797)
0.517	0.00764	(110)	0.00797	(354)	0.00783	(535)	0.00738	(739)
0.556	0.00789	(104)	0.00804	(380)	0.0075	(584)	0.00762	(831)
0.613	0.00904	(340)	0.00891	(98)	0.00887	(544)	0.00863	(772)
0.681	0.00985	(770)	0.01017	(527)	0.00939	(353)	0.00987	(113)
0.781	0.01092	(784)	0.01102	(536)	0.0116	(355)	0.01097	.....

RESULT SUMMARY (No Tripper Strip)
========== (Feather, Paint, Lightly Sanded) -- Flt. 137 --

C_L	c_d(ref)		c_d					
0.172	0.00572	(356)	0.00606	(107)	0.00596	(551)	0.00544	(779)
0.184	0.00548	(377)	0.00614	(111)	0.00548	(583)	.....	
0.192	.....		.....		.....		.....	
0.204	0.00569	(372)	0.0059	(115)	0.00617	(585)	0.00548	(837)
0.219	0.00597	(357)	0.0059	(112)	0.00603	(557)	0.00605	(797)
0.231	0.00649	(56)	0.00636	(376)	0.00655	(648)	.....	
0.25	0.00701	(116)	0.0066	(373)	0.00713	(566)	0.00713	(819)
0.262	.....		.....		.....		.....	
0.286	0.00678	(808)	0.00689	(553)	0.00666	(108)	.....	
0.301	0.00697	(389)	0.00634	(107)	0.007	(566)	0.00633	(814)
0.322	0.00659	(531)	0.00677	(343)	0.0067	(108)	0.00619	(749)
0.349	0.00675	(781)	0.00705	(558)	0.00678	(366)	0.00659	(119)
0.365	0.00706	(563)	0.00707	(793)	0.00686	(357)	0.00712	(111)
0.395	0.007	(622)	0.00679	(387)	0.00717	(107)	.....	
0.466	0.00713	(108)	0.0076	(360)	0.00716	(586)	0.00689	(852)
0.557	0.00842	(846)	0.00842	(575)	0.00844	(367)	0.0077	(106)
0.699	0.01036	(608)	0.01048	(378)	0.01001	(108)	.....	
0.877	.....		.....		.....		.....	

RESULT SUMMARY (5% Tripper Strip)
========== (Feather, Paint, Lightly Sanded) -- Flt. 138 --

C_L	c_d(ref)		c_d					
0.18	.....		.....		.....		.....	
0.196	0.00966	(719)	0.00961	(516)	0.00949	(310)	0.00992	(106)
0.207	0.00957	(554)	0.00958	(769)	0.00927	(355)	0.00975	(114)
0.218	0.00944	(498)	0.00952	(712)	0.00911	(318)	.....	
0.23	0.00923	(564)	0.00918	(769)	0.00914	(369)	0.00934	(107)
0.244	0.00973	(306)	0.00957	(471)	0.00983	(691)	.....	
0.258	0.00957	(331)	0.0098	(501)	0.00953	(103)	.....	
0.275	0.00969	(700)	0.00992	(106)	.....		.....	
0.291	0.00982	(736)	0.00974	(513)	0.0099	(332)	0.0098	(109)
0.317	0.00977	(488)	0.00971	(688)	0.00996	(318)	0.00932	(108)
0.335	0.01001	(763)	0.00988	(529)	0.01	(335)	.....	
0.373	0.0103	(520)	0.01009	(734)	0.01025	(336)	.....	
0.395	0.01001	(102)	.....		0.00984	(682)	.....	
0.427	0.01006	(764)	0.01021	(538)	0.01001	(354)	0.00997	(111)
0.457	0.0102	(760)	0.01081	(541)	0.01074	(337)	0.01028	(106)
0.507	.....		.....		.....		.....	
0.55	0.01094	(105)	0.01104	(342)	0.01049	(560)	.....	
0.612	0.01087	(107)	0.01086	(357)	0.01136	(799)	.....	
0.673	0.01038	(750)	0.01049	(513)	0.01091	(97)	.....	
0.762	0.01198	(498)	0.01145	(707)	0.01156	(95)	0.0126	(310)
0.84	0.01349	(100)	0.01271	(343)	0.01353	(532)	.....	

RESULT SUMMARY (10% Tripper Strip)
========== (Feather, Paint, Lightly Sanded) -- Flt. 139 --

C_L	c_d(ref)		c_d					
0.179	0.00876	(765)	.....		0.00918	(332)	0.00861	(53)
0.194	0.00871	(575)	0.00876	(804)	0.00871	(368)	0.00888	(112)
0.206	0.00899	(819)	0.00889	(361)	0.00906	(107)	.....	
0.219	0.00917	(112)	0.00884	(385)	0.0093	(606)	0.00906	(859)
0.23	0.00893	(122)	0.0088	(382)	0.00903	(613)	.....	
0.242	0.00938	(112)	0.00916	(705)	.....		.....	
0.26	0.00921	(112)	0.00876	(375)	0.00903	(576)	0.00924	(796)
0.279	0.00936	(118)	0.00941	(349)	0.00954	(585)	0.00927	(836)
0.292	0.0092	(124)	0.00921	(388)	0.0098	(590)	0.00935	(826)
0.319	0.00955	(544)	0.0097	(340)	.....		.....	
0.337	0.00966	(687)	0.00983	(480)	0.00989	(310)	0.00881	(119)
0.36	0.00966	(109)	0.01016	(329)	0.01001	(518)	0.00954	(706)
0.402	0.01017	(553)	0.00966	(759)	0.01027	(344)	.....	
0.422	.....		.....		.....		.....	
0.461	0.00998	(805)	0.0095	(574)	0.00976	(366)	0.01023	(108)
0.494	0.00977	(570)	0.01015	(837)	0.0101	(360)	0.00965	(117)
0.542	0.01035	(339)	0.01072	(104)	0.01035	(523)	0.00958	(728)
0.603	0.01044	(115)	0.01041	(338)	0.01018	(517)	0.01119	(752)
0.654	0.01116	(108)	0.01161	(383)	0.01112	(586)	0.01091	(819)
0.731	0.01151	(116)	0.01273	(358)	0.01203	(593)	0.01089	(831)
0.835	0.01334	(503)	0.01275	(727)	0.01342	(312)	0.01288	(107)

RESULT SUMMARY (25% Tripper Strip)
========== (Feather, Paint, Lightly Sanded) -- Flt. 140 --

C_L	c_d(ref)		c_d					
0.18	0.00741	(540)	0.00744	(759)	0.00724	(340)	0.0074	(114)
0.19	0.00746	(122)	0.0075	(374)	0.0078	(568)	0.00735	(768)
0.201	.....		.....		.....		.....	
0.215	0.00771	(343)	0.00749	(111)	0.00771	(584)	0.00777	(813)
0.231	0.00768	(813)	0.00773	(563)	0.00738	(353)	0.00779	(114)
0.241	0.0075	(96)	0.00778	(379)	0.00747	(614)	.....	
0.259	0.00796	(111)	0.00824	(364)	0.00772	(593)	0.00797	(846)
0.274	0.00777	(635)	0.00756	(394)	0.00812	(107)	.....	
0.29	.....		.....		.....		.....	
0.314	0.00782	(109)	0.00803	(376)	0.0077	(577)	0.00816	(818)
0.343	0.00825	(114)	0.00844	(356)	0.00801	(558)	0.00836	(773)
0.361	0.00785	(579)	0.00798	(823)	0.00775	(374)	0.00774	(118)
0.412	0.00788	(623)	0.00801	(112)	.....		.....	
0.44	0.00807	(791)	0.00769	(563)	0.00831	(342)	0.00782	(112)
0.472	0.0079	(826)	0.00807	(590)	0.00772	(367)	0.00777	(112)
0.496	0.00789	(112)	0.00833	(340)	0.00802	(553)	0.00772	(781)
0.555	0.00864	(106)	0.00909	(342)	0.00826	(557)	0.00839	(792)
0.61	0.00896	(790)	0.00903	(348)	.....		.....	
0.678	0.01009	(387)	0.01094	(102)	0.00964	(624)	.....	
0.769	0.01205	(477)	0.0114	(688)	0.01205	(303)	0.01156	(87)
0.856	0.01356	(590)	0.01373	(854)	0.01312	(347)	0.01337	(101)

APPENDIX C

SPEED POWER DATA

SPEED POWER DATA

The following computer printouts were provided by Mooney Aircraft with no data diskettes to allow automated data transfer. The data were entered by hand into a spread sheet and the drag polars were calculated at Texas A&M. The statistical information indicating the data scatter are shown on the second sheet. These data reductions (all done in Lotus 1-2-3 worksheet files) are included on the data diskettes supplied with the report. These data diskettes will allow interested readers to duplicate the results summarized in the body of the the report. The Mooney data are included as the original source documents.

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 3 ← Should be Flt No. 2

BASELINE N1173W LAMINAR FLOW STUDIES 5-4-83

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	44	174.786	36.1

BAD Torquemeter

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
159.4	158.9	194.5	.8694	2708.0	.1811	.0263	.0328	49.3	.0691
156.6	156.2	185.4	.8696	2697.0	.1868	.0264	.0349	49.1	.0731
152.1	151.7	172.7	.8702	2687.0	.1973	.0267	.0389	48.2	.0802
148.1	147.7	162.6	.8705	2683.0	.2077	.0211	.0431	47.3	.0871
144.4	144.1	153.0	.8708	2676.0	.2179	.0215	.0475	46.6	.0944
140.6	140.3	138.8	.8698	2667.0	.229	.0211	.0524	47.5	.1063
135.1	134.8	126.1	.8662	2664.0	.2477	.0215	.0613	46.6	.122
128.3	128.0	114.5	.8629	2660.0	.2741	.0227	.0751	44.1	.1416
125.6	125.4	105.9	.8606	2656.0	.2856	.0223	.0815	44.9	.1563
122.2	122.0	99.3	.8588	2654.0	.3014	.0226	.0908	44.2	.1714
118.1	117.9	92.2	.8567	2653.0	.3225	.0232	.104	43.1	.1913

Data not reduced at TAMU due to bad torquemeter.

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 0 ← Should be Flt No. 5

N1173W BASELINE 5-5-83 BOOM#1 WING RAKE

FLT 5

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	55	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
159.2	158.7	200.5	.8673	2730.0	.183	.0207	.0335	48.3	.0691
152.9	152.5	184.6	.8678	2726.0	.1981	.0215	.0392	46.5	.0778
148.5	148.1	174.8	.8681	2722.0	.2096	.0222	.0439	45.0	.0843
145.1	144.7	161.4	.8685	2712.0	.2187	.022	.0478	45.4	.0927
140.0	139.7	145.5	.8686	2699.0	.2337	.0221	.0546	45.3	.1056
129.7	129.4	120.8	.8618	2695.0	.2718	.0229	.0739	43.7	.1379
121.1	120.9	109.5	.858	2693.0	.3114	.0253	.097	39.5	.1634
117.3	117.1	99.7	.8554	2687.0	.3311	.0253	.1096	39.5	.185
113.4	113.2	95.6	.8536	2685.0	.3539	.0268	.1253	37.3	.1996
108.5	108.3	91.5	.8423	2679.0	.3857	.0289	.1487	34.6	.2199
105.9	105.7	81.2	.8403	2677.0	.4045	.0275	.1636	36.4	.2541
101.2	101.1	78.1	.8374	2674.0	.4424	.0302	.1957	33.1	.2768

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 0 ← Should be Flt No. 8

BASELINE N1173W 5-19-83 BOOM #1 WING RAKE

Flt 8

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	51	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
159.2	158.7	202.0	.8656	2728.0	.1829	.0209	.0334	47.8	.0683
152.1	151.7	177.9	.8662	2725.0	.2001	.0211	.04	47.4	.0809
147.2	146.8	165.0	.8666	2722.0	.2133	.0216	.0455	46.3	.0899
143.4	143.1	157.8	.8667	2720.0	.2245	.0223	.0504	44.8	.0964
139.6	139.3	143.9	.866	2718.0	.2367	.0221	.056	45.3	.1085
134.0	133.7	132.6	.8629	2716.0	.2566	.0229	.0659	43.7	.1229
129.7	129.4	119.3	.8594	2713.0	.2736	.0226	.0748	44.2	.1413
131.0	130.7	124.4	.8606	2711.0	.268	.0229	.0718	43.6	.1338
125.1	124.9	114.6	.8577	2710.0	.2937	.0241	.0862	41.4	.1525
116.9	116.7	101.8	.8535	2707.0	.3358	.0261	.1128	38.3	.1842
113.4	113.2	97.2	.8426	2703.0	.3563	.027	.1269	37.1	.2008
110.1	109.9	87.9	.8495	2702.0	.3778	.0269	.1427	37.2	.2267
102.1	102.0	82.3	.8367	2700.0	.4388	.0311	.1926	32.2	.2646

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 21

N1173W (NASA) BASE LINE AFTER REBUILD--WING RAKE--A/S Boom

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	50	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
112.6	112.4	91.5	.8503	2713.0	.3627	.0262	.1315	38.1	.2142
120.4	120.2	103.9	.8543	2696.0	.3154	.0245	.0994	40.9	.1736
128.5	128.2	116.2	.8581	2682.0	.2755	.0226	.0759	44.2	.1432
133.2	132.9	128.5	.8613	2666.0	.2549	.0226	.065	44.3	.123
139.3	139.0	140.4	.8646	2654.0	.2321	.0216	.0539	46.2	.1063
144.3	144.0	151.1	.8667	2644.0	.2156	.021	.0465	47.6	.0944
147.3	146.9	160.9	.8664	2629.0	.2057	.021	.0423	47.5	.0859
152.6	152.2	171.2	.866	2621.0	.1912	.0201	.0365	49.7	.0775
155.3	154.9	179.4	.8657	2613.0	.184	.02	.0339	50.0	.0723
158.5	158.1	192.3	.8654	2603.0	.176	.0202	.031	49.6	.0656
162.5	162.0	204.6	.8649	2591.0	.1668	.0199	.0278	50.2	.0596

BARE AIRPLANE, N1173W, FREE TRANSITION, FLT 21

7-7-83

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0180			0.0180		
0.1668	0.0278	0.0199	0.0008	0.0006	0.0198	4.30E-09	3.79E-06
0.1760	0.0310	0.0202	0.0010	0.0006	0.0200	2.60E-08	3.04E-06
0.1840	0.0339	0.0200	0.0011	0.0007	0.0202	5.08E-08	2.42E-06
0.1912	0.0366	0.0201	0.0013	0.0007	0.0204	9.02E-08	1.91E-06
0.2057	0.0423	0.0210	0.0018	0.0009	0.0208	5.15E-08	1.02E-06
0.2156	0.0465	0.0210	0.0022	0.0010	0.0210	1.88E-09	5.45E-07
0.2321	0.0539	0.0216	0.0029	0.0012	0.0215	6.10E-09	6.76E-08
0.2549	0.0650	0.0226	0.0042	0.0015	0.0222	1.29E-07	2.11E-07
0.2755	0.0759	0.0226	0.0058	0.0017	0.0229	1.22E-07	1.36E-06
0.3154	0.0995	0.0245	0.0099	0.0024	0.0245	5.56E-10	7.26E-06
0.3527	0.1244	0.0261	0.0155	0.0032	0.0261	8.41E-11	1.86E-05
						4.82E-07	4.02E-05

Straight Line Fit Statistics

$C_D = .018032 + .064783 C_L^2$

Mean = 2.178181818182E-02

SEE = 2.313974380158E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 23

BASELINE SPEED/POWER-LT.WT.,LOW ALT.

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
3000	71	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
169.1	168.9	206.7	.8755	2619.0	.1552	.0194	.0241	51.7	.0531
163.8	163.6	193.3	.8759	2609.0	.1647	.0199	.0271	50.2	.0581
161.0	160.8	185.1	.8762	2603.0	.1701	.0201	.0289	49.8	.0614
123.4	123.3	99.2	.8546	2583.0	.2871	.0233	.0824	42.9	.151
130.6	130.5	112.6	.8594	2580.0	.256	.0224	.0656	44.5	.1247
136.6	136.5	123.9	.8636	2572.0	.2333	.0217	.0544	46.1	.1072

BARE AIRPLANE, N1173W, FREE TRANSITION, FLT 23

7-12-83

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0181			0.0181		
0.1552	0.0241	0.0194	0.0006	0.0005	0.0196	6.10E-08	2.21E-06
0.1647	0.0271	0.0199	0.0007	0.0005	0.0198	3.22E-09	1.66E-06
0.1701	0.0289	0.0201	0.0008	0.0006	0.0200	1.96E-08	1.38E-06
0.2333	0.0544	0.0217	0.0030	0.0012	0.0216	8.65E-09	2.24E-07
0.2560	0.0655	0.0224	0.0043	0.0015	0.0223	5.70E-09	1.42E-06
0.2871	0.0824	0.0233	0.0068	0.0019	0.0234	1.34E-08	5.21E-06
						1.11E-07	1.21E-05

Straight Line Fit Statistics

$C_D = .018091 + .064598 C_L^2$

Mean = 2.113333333333E-02

SEE = 1.669578998899E-04

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 40

N1173W 10% TRIPPER STRIP (DUCT TAPE) 8-3-83

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
7000	59	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
111.8	111.6	96.6	.8444	2762.0	.3744	.0284	.1402	35.3	.2111
117.8	117.6	105.4	.8571	2758.0	.3368	.0268	.1135	37.2	.1804
122.0	121.8	112.1	.8594	2755.0	.3138	.0258	.0984	38.8	.163
126.3	126.1	118.2	.8615	2750.0	.2923	.0246	.0854	40.7	.1484
129.7	129.5	126.0	.8636	2742.0	.2764	.0242	.0764	41.2	.1345
135.3	135.0	138.8	.8672	2735.0	.2534	.0236	.0642	42.3	.116
139.2	138.9	149.1	.8699	2725.0	.2386	.0234	.0569	42.7	.1038
143.5	143.2	155.8	.8707	2714.0	.2236	.0223	.05	44.8	.0956
147.7	147.4	168.1	.8703	2699.0	.21	.0221	.0441	45.2	.0851
151.6	151.3	179.4	.87	2690.0	.1987	.0218	.0395	45.8	.0772
156.1	155.7	189.7	.8698	2681.0	.1868	.0211	.0349	47.3	.0705
159.2	158.8	199.0	.8696	2669.0	.1788	.0209	.032	47.9	.0653

BARE AIRPLANE, N1173W, TRANSITION FIXED AT 0.10C, FLT 40

8-3-83

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0190			0.0190		
0.1788	0.0320	0.0209	0.0010	0.0007	0.0212	8.05E-08	6.59E-06
0.1868	0.0349	0.0211	0.0012	0.0007	0.0214	8.01E-08	5.60E-06
0.1987	0.0395	0.0218	0.0016	0.0009	0.0217	1.09E-08	4.22E-06
0.2100	0.0441	0.0221	0.0019	0.0010	0.0220	8.03E-09	3.03E-06
0.2236	0.0500	0.0223	0.0025	0.0011	0.0224	1.26E-08	1.79E-06
0.2386	0.0569	0.0234	0.0032	0.0013	0.0229	2.66E-07	7.49E-07
0.2534	0.0642	0.0236	0.0041	0.0015	0.0234	4.80E-08	1.36E-07
0.2764	0.0764	0.0242	0.0058	0.0018	0.0242	1.29E-10	2.13E-07
0.2923	0.0854	0.0246	0.0073	0.0021	0.0248	5.18E-08	1.16E-06
0.3138	0.0985	0.0258	0.0097	0.0025	0.0257	7.11E-09	3.86E-06
0.3368	0.1134	0.0268	0.0129	0.0030	0.0267	4.17E-09	8.91E-06
0.3744	0.1402	0.0284	0.0196	0.0040	0.0286	2.49E-08	2.31E-05
						5.94E-07	5.94E-05

Straight Line Fit Statistics

$C_D = .019005 + .068149 C_L^2$

Mean = 2.375000000000E-02

SEE = 2.436611352861E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 43

N1173W 10% STRIPS REPAIRED GR DOOR 8-10-83

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	55	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
100.8	100.7	80.7	.837	2773.0	.4624	.0315	.2138	31.7	.2893
108.9	108.7	89.5	.8422	2766.0	.3953	.0279	.1562	35.8	.2388
113.0	112.8	97.2	.8445	2758.0	.3661	.0272	.134	36.7	.2101
117.8	117.6	107.4	.8566	2746.0	.3355	.0269	.1126	37.1	.1783
123.3	123.1	110.5	.8586	2744.0	.3061	.0242	.0937	41.2	.165
126.7	126.5	121.3	.8614	2736.0	.2891	.0246	.0836	40.6	.1449
130.1	129.8	128.5	.8635	2728.0	.2734	.0241	.0748	41.4	.1322
134.4	134.1	135.7	.8657	2722.0	.2557	.0232	.0654	43.1	.1203
140.1	139.8	148.6	.8689	2715.0	.2348	.0225	.0551	44.4	.1045
144.3	144.0	159.4	.8686	2707.0	.2207	.0221	.0487	45.2	.0941
147.7	147.3	169.1	.8683	2700.0	.2102	.0219	.0442	45.7	.0862
152.1	151.7	181.0	.868	2692.0	.1976	.0214	.0391	46.7	.0778
157.8	157.4	197.9	.8676	2681.0	.1829	.021	.0335	47.6	.0681

BARE AIRPLANE, N1173W, TRANSITION FIXED AT 0.10C, FLT 43

8-10-83

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0190			0.0190		
0.1829	0.0335	0.0210	0.0011	0.0007	0.0211	1.07E-08	1.15E-05
0.1976	0.0390	0.0214	0.0015	0.0008	0.0215	3.89E-09	9.23E-06
0.2102	0.0442	0.0219	0.0020	0.0010	0.0218	1.16E-08	7.33E-06
0.2207	0.0487	0.0221	0.0024	0.0011	0.0221	2.92E-10	5.84E-06
0.2348	0.0551	0.0225	0.0030	0.0012	0.0225	2.16E-11	4.02E-06
0.2557	0.0654	0.0232	0.0043	0.0015	0.0232	2.15E-09	1.81E-06
0.2734	0.0747	0.0241	0.0056	0.0018	0.0238	1.19E-07	5.55E-07
0.2891	0.0836	0.0246	0.0070	0.0021	0.0243	7.72E-08	3.16E-08
0.3061	0.0937	0.0242	0.0088	0.0023	0.0250	5.96E-07	2.23E-07
0.3355	0.1126	0.0269	0.0127	0.0030	0.0262	5.14E-07	2.83E-06
0.3661	0.1340	0.0272	0.0180	0.0036	0.0276	1.31E-07	9.38E-06
0.3953	0.1563	0.0279	0.0244	0.0044	0.0290	1.19E-06	2.02E-05
0.4264	0.1818	0.0315	0.0331	0.0057	0.0306	7.56E-07	3.76E-05
						3.41E-06	1.11E-04

Straight Line Fit Statistics

$C_D = .018955 + .064217C_L^2$

Mean = 2.450000000000E-02

SEE = 5.566447232030E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 44

N1173W 10% STRIPS 8-11-83

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	57	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
157.9	157.5	201.0	.8683	2774.0	.189	.0213	.0357	47.0	.0718
152.1	151.7	183.5	.8688	2760.0	.2026	.0217	.0411	46.1	.0807
147.6	147.2	172.2	.8691	2755.0	.2147	.0223	.0461	44.9	.0883
144.2	143.9	160.9	.8694	2744.0	.224	.0223	.0502	44.8	.0959
139.2	138.9	148.6	.8697	2736.0	.2396	.0229	.0574	43.6	.1069
134.9	134.6	138.8	.8675	2729.0	.2545	.0235	.0647	42.6	.1178
131.4	131.1	129.6	.865	2721.0	.2674	.0236	.0715	42.3	.1291
127.1	126.9	121.3	.8625	2715.0	.2851	.0244	.0813	41.0	.1424
121.7	121.5	108.5	.859	2711.0	.3104	.0247	.0963	40.5	.1664
119.1	118.9	103.8	.8575	2707.0	.3236	.0252	.1047	39.7	.1775
113.4	113.2	96.6	.8547	2699.0	.3558	.027	.1266	37.0	.1998
107.6	107.4	88.4	.8425	2693.0	.3942	.0286	.1554	35.0	.2323
103.9	103.8	81.2	.8396	2692.0	.4225	.029	.1785	34.5	.2626

BARE AIRPLANE, N1173W, TRANSITION FIXED AT 0.10C, FLT 44

8-11-83

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0196			0.0196		
0.1890	0.0357	0.0213	0.0013	0.0008	0.0216	8.97E-08	7.54E-06
0.2026	0.0410	0.0217	0.0017	0.0009	0.0219	3.77E-08	6.01E-06
0.2147	0.0461	0.0223	0.0021	0.0010	0.0222	1.60E-08	4.72E-06
0.2240	0.0502	0.0223	0.0025	0.0011	0.0224	9.88E-09	3.79E-06
0.2396	0.0574	0.0229	0.0033	0.0013	0.0228	1.01E-08	2.39E-06
0.2545	0.0648	0.0235	0.0042	0.0015	0.0232	8.59E-08	1.30E-06
0.2674	0.0715	0.0236	0.0051	0.0017	0.0236	4.22E-10	5.88E-07
0.2851	0.0813	0.0244	0.0066	0.0020	0.0241	7.81E-08	5.09E-08
0.3104	0.0963	0.0247	0.0093	0.0024	0.0250	6.46E-08	3.70E-07
0.3236	0.1047	0.0252	0.0110	0.0026	0.0254	4.72E-08	1.15E-06
0.3558	0.1266	0.0270	0.0160	0.0034	0.0266	1.39E-07	5.21E-06
0.3942	0.1554	0.0286	0.0241	0.0044	0.0282	1.43E-07	1.50E-05
0.4225	0.1785	0.0290	0.0319	0.0052	0.0295	2.50E-07	2.66E-05
						9.72E-07	7.47E-05

Straight Line Fit Statistics

$C_D = .019623 + .055333C_L^2$

Mean = 2.434615384615E-02

SEE = 2.972282685644E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 45

N1173W 10% STRIPS 8-11-83

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
9000	53	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
156.1	155.6	200.0	.8665	2751.0	.1919	.0215	.0368	46.4	.073
149.4	149.0	176.3	.867	2738.0	.2084	.0216	.0434	46.2	.0857
137.9	137.6	145.5	.8678	2730.0	.2438	.0227	.0594	44.0	.1117
130.5	130.2	129.6	.8642	2713.0	.2704	.0238	.0731	42.1	.1314
118.2	118.0	104.9	.8567	2706.0	.3285	.0256	.1079	39.0	.1798
111.3	111.1	94.1	.8437	2701.0	.3697	.0271	.1367	36.9	.2153
105.5	105.3	90.0	.841	2697.0	.4107	.0303	.1687	33.0	.2375

BARE AIRPLANE, N1173W, TRANSITION FIXED AT 0.10C, FLT 45

8-11-83

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0189			0.0189		
0.1919	0.0368	0.0215	0.0014	0.0008	0.0213	5.30E-08	1.15E-05
0.2084	0.0434	0.0216	0.0019	0.0009	0.0217	9.03E-09	8.77E-06
0.2438	0.0594	0.0227	0.0035	0.0013	0.0227	6.55E-10	3.73E-06
0.2704	0.0731	0.0238	0.0053	0.0017	0.0236	3.76E-08	1.10E-06
0.3285	0.1079	0.0256	0.0116	0.0028	0.0258	6.07E-08	1.41E-06
0.3697	0.1367	0.0271	0.0187	0.0037	0.0277	3.58E-07	9.25E-06
0.4107	0.1687	0.0303	0.0285	0.0051	0.0298	2.94E-07	2.60E-05
						8.12E-07	6.18E-05

Straight Line Fit Statistics

$C_D = .018899 + .064379 C_L^2$

Mean = 2.465714285714E-02

SEE = 4.030916272723E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 46

N1173W BASELINE 8-12-83

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	59	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
160.1	159.6	202.6	.8691	2767.0	.1834	.0205	.0336	48.7	.07
154.8	154.4	184.0	.8697	2757.0	.1954	.0206	.0382	48.5	.079
152.1	151.7	174.3	.87	2749.0	.2018	.0206	.0407	48.5	.0844
148.5	148.1	164.0	.8704	2737.0	.2108	.0208	.0444	48.0	.091
144.7	144.4	152.7	.8708	2737.0	.2219	.021	.0492	47.7	.1002
139.2	138.9	142.9	.8701	2729.0	.239	.022	.0571	45.4	.1108
134.9	134.6	134.7	.8677	2724.0	.254	.0227	.0645	44.0	.1211
130.5	130.2	122.4	.8644	2719.0	.2708	.0227	.0734	44.0	.1378
126.3	126.1	114.1	.862	2716.0	.2888	.0233	.0834	42.9	.1528
122.4	122.2	109.5	.8604	2711.0	.3068	.0245	.0942	40.8	.164
118.6	118.4	101.8	.8582	2704.0	.3259	.025	.1062	40.0	.1816
113.4	113.2	98.2	.8468	2700.0	.3559	.0272	.1267	36.8	.1989
110.1	109.9	88.4	.8532	2693.0	.3765	.0269	.1418	37.1	.2247

BARE AIRPLANE, N1173W, FREE TRANSITION, FLT 46

8-12-83

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0180			0.0180		
0.1834	0.0336	0.0205	0.0011	0.0007	0.0203	5.52E-08	6.98E-06
0.1954	0.0382	0.0206	0.0015	0.0008	0.0206	1.05E-09	5.48E-06
0.2018	0.0407	0.0206	0.0017	0.0008	0.0207	1.87E-08	4.71E-06
0.2108	0.0444	0.0208	0.0020	0.0009	0.0210	3.39E-08	3.70E-06
0.2219	0.0492	0.0210	0.0024	0.0010	0.0213	9.23E-08	2.57E-06
0.2390	0.0571	0.0220	0.0033	0.0013	0.0218	2.94E-08	1.16E-06
0.2540	0.0645	0.0227	0.0042	0.0015	0.0223	1.44E-07	3.45E-07
0.2708	0.0733	0.0227	0.0054	0.0017	0.0229	4.31E-08	7.25E-15
0.2888	0.0834	0.0233	0.0070	0.0019	0.0236	7.74E-08	4.49E-07
0.3068	0.0941	0.0245	0.0089	0.0023	0.0243	4.33E-08	1.92E-06
0.3259	0.1062	0.0250	0.0113	0.0027	0.0251	9.26E-09	4.79E-06
0.3559	0.1267	0.0272	0.0160	0.0034	0.0265	5.51E-07	1.26E-05
0.3765	0.1418	0.0269	0.0201	0.0038	0.0275	3.16E-07	2.07E-05
						1.41E-06	6.55E-05

Straight Line Fit Statistics

$C_D = .018026 + .066568C_L^2$

Mean = 2.290769230769E-02

SEE = 3.585791859714E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 52

N1173W 25% TRIPPER STRIPS 8-22-83

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
9000	55	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
157.4	156.9	204.1	.8671	2772.0	.1902	.0214	.0362	46.7	.0722
152.1	151.6	185.1	.8677	2758.0	.2026	.0215	.0411	46.5	.0814
148.1	147.7	172.7	.8679	2745.0	.2126	.0217	.0452	46.0	.0888
143.4	143.0	156.3	.8686	2728.0	.2253	.0217	.0508	46.1	.1
139.2	138.8	149.1	.8686	2724.0	.2387	.0226	.057	44.2	.1076
134.0	133.7	139.3	.868	2717.0	.2569	.0237	.066	42.3	.1191
128.9	128.6	123.4	.8637	2711.0	.2769	.0234	.0767	42.7	.1398
126.4	126.1	119.3	.8624	2707.0	.2875	.024	.0827	41.7	.1473
120.8	120.6	109.0	.8592	2703.0	.3142	.025	.0987	40.0	.1688
116.9	116.7	103.3	.857	2701.0	.3352	.026	.1124	38.4	.1842
112.5	112.3	98.7	.8458	2697.0	.3613	.0275	.1306	36.3	.2024
108.5	108.3	88.4	.843	2692.0	.3877	.0274	.1503	36.5	.2341

BARE AIRPLANE, N1173W, TRANSITION FIXED AT 0.10C, FLT 52

8-22-83

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0192			0.0192		
0.1902	0.0362	0.0214	0.0013	0.0008	0.0213	1.06E-08	6.39E-06
0.2026	0.0410	0.0215	0.0017	0.0009	0.0216	7.21E-09	5.02E-06
0.2126	0.0452	0.0217	0.0020	0.0010	0.0218	1.70E-08	3.98E-06
0.2253	0.0508	0.0217	0.0026	0.0011	0.0222	2.11E-07	2.78E-06
0.2387	0.0570	0.0226	0.0032	0.0013	0.0225	5.41E-09	1.69E-06
0.2569	0.0660	0.0237	0.0044	0.0016	0.0231	4.10E-07	5.86E-07
0.2769	0.0767	0.0234	0.0059	0.0018	0.0237	8.44E-08	1.81E-08
0.2875	0.0827	0.0240	0.0068	0.0020	0.0240	1.94E-09	4.80E-08
0.3142	0.0987	0.0250	0.0097	0.0025	0.0250	4.16E-11	1.37E-06
0.3352	0.1124	0.0260	0.0126	0.0029	0.0258	4.02E-08	3.90E-06
0.3613	0.1305	0.0275	0.0170	0.0036	0.0269	3.92E-07	9.30E-06
0.3877	0.1503	0.0274	0.0226	0.0041	0.0280	4.13E-07	1.78E-05
						1.59E-06	5.28E-05

Straight Line Fit Statistics

$C_D = .019159 + .059101 C_L^2$

Mean = 2.382500000000E-02

SEE = 3.990580235968E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 53

N1173W 25% STRIPS 8-25-83

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	55	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
159.4	158.9	201.5	.8673	2768.0	.1851	.0207	.0343	48.2	.0706
152.9	152.5	183.5	.8679	2741.0	.1991	.0214	.0397	46.7	.0791
146.8	146.4	168.6	.8683	2730.0	.2151	.0222	.0463	45.0	.0889
143.4	143.1	159.4	.8685	2726.0	.225	.0225	.0506	44.4	.096
138.8	138.5	145.0	.8684	2708.0	.2386	.0226	.0569	44.3	.1076
134.0	133.7	136.7	.8658	2705.0	.2556	.0236	.0653	42.4	.1183
130.5	130.2	129.0	.8637	2697.0	.2687	.024	.0722	41.6	.1283
122.0	121.8	118.8	.8596	2688.0	.3062	.0269	.0938	37.1	.1486
117.8	117.6	98.2	.8553	2681.0	.3276	.0246	.1073	40.6	.1862

OIC

WW!

BARE AIRPLANE, N1173W, TRANSITION FIXED AT 0.10C, FLT 53

8-23-83

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0189			0.0189		
0.1851	0.0343	0.0207	0.0012	0.0007	0.0212	2.81E-07	3.75E-06
0.1991	0.0396	0.0214	0.0016	0.0008	0.0216	3.75E-08	2.47E-06
0.2151	0.0463	0.0222	0.0021	0.0010	0.0220	2.52E-08	1.27E-06
0.2250	0.0506	0.0225	0.0026	0.0011	0.0223	2.71E-08	6.91E-07
0.2386	0.0569	0.0226	0.0032	0.0013	0.0228	2.60E-08	1.64E-07
0.2556	0.0653	0.0236	0.0043	0.0015	0.0233	7.35E-08	2.63E-08
0.2687	0.0722	0.0240	0.0052	0.0017	0.0238	4.29E-08	3.92E-07
0.3062	0.0938	0.0269	0.0088	0.0025	0.0252	2.73E-06	4.34E-06
0.3276	0.1073	0.0246	0.0115	0.0026	0.0262	2.45E-06	8.99E-06
						5.69E-06	2.21E-05

Straight Line Fit Statistics

$C_D = .018916 + .067546C_L^2$

Mean = 2.316666666667E-02

SEE = 9.014982362543E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 58

N1173W 5% STRIPS 9-23-83

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	51	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
157.4	157.0	204.1	.8654	2763.0	.1895	.0218	.0359	45.8	.0702
152.1	151.7	186.1	.866	2750.0	.2019	.0221	.0408	45.3	.0788
147.6	147.2	173.8	.8661	2743.0	.2138	.0226	.0457	44.3	.0865
143.5	143.2	159.4	.8666	2732.0	.2252	.0225	.0507	44.4	.0962
139.2	138.9	152.2	.8666	2729.0	.239	.0235	.0571	42.5	.1036
134.9	134.6	139.3	.8644	2726.0	.2542	.0236	.0646	42.4	.1168
131.0	130.7	129.6	.8618	2718.0	.2687	.0239	.0722	41.8	.1289
126.3	126.1	120.8	.8591	2714.0	.2886	.0248	.0833	40.4	.1435
122.0	121.8	108.5	.856	2712.0	.309	.0246	.0955	40.7	.1657
117.3	117.1	103.3	.8538	2707.0	.3335	.0263	.1113	38.1	.1808
113.1	112.9	97.2	.8425	2705.0	.3584	.0272	.1285	36.8	.2017

BARE AIRPLANE, N1173W, TRANSITION FIXED AT 0.10C, FLT 58

9-23-83

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0199			0.0199		
0.1895	0.0359	0.0218	0.0013	0.0008	0.0219	9.18E-09	4.02E-06
0.2019	0.0408	0.0221	0.0017	0.0009	0.0222	4.79E-09	3.00E-06
0.2158	0.0466	0.0226	0.0022	0.0011	0.0225	1.08E-08	1.97E-06
0.2252	0.0507	0.0225	0.0026	0.0011	0.0227	5.28E-08	1.37E-06
0.2390	0.0571	0.0235	0.0033	0.0013	0.0231	1.68E-07	6.55E-07
0.2542	0.0646	0.0236	0.0042	0.0015	0.0235	7.58E-09	1.50E-07
0.2687	0.0722	0.0239	0.0052	0.0017	0.0239	1.60E-09	1.60E-09
0.2886	0.0833	0.0248	0.0069	0.0021	0.0246	5.54E-08	4.42E-07
0.3090	0.0955	0.0246	0.0091	0.0023	0.0253	4.24E-07	1.83E-06
0.3335	0.1112	0.0263	0.0124	0.0029	0.0261	2.62E-08	5.01E-06
0.3584	0.1285	0.0272	0.0165	0.0035	0.0271	8.35E-09	1.03E-05
						7.69E-07	2.87E-05

Straight Line Fit Statistics

$C_D = .019873 + .056330C_L^2$

Mean = 2.390000000000E-02

SEE = 2.922298779147E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 71

CLEAN-PRESSURE BELT-WING RAKE

Data not reduced at TAMU due to Wing Rake and Pressure Belt

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	39	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
159.3	158.8	202.1	.8704	2804	.1877	.0212	.0352	47.1	.0709
152.6	152.2	186	.8708	2797.6	.204	.0222	.0416	45	.08
141.3	141	146.8	.872	2778.4	.2362	.0221	.0558	45.2	.1077
135.7	135.4	122.7	.8671	2773.8	.2556	.0207	.0653	48.2	.1345
125.5	125.3	102.5	.8613	2770.3	.2983	.0217	.089	46	.1748
118.6	118.4	92	.8582	2768	.3337	.023	.1113	43.4	.2064
112.5	112.3	86.5	.8549	2765.1	.3703	.0253	.1371	39.6	.2318

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 72

CLEAN/PRESSURE BELT/RAKE

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
9000	40	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
158.5	158	202	.86	2775	.1878	.0209	.0353	47.9	.0721
154.9	154.4	195.4	.8601	2771	.1963	.0216	.0385	46.2	.076
149.1	148.7	175.3	.8608	2766	.2114	.0218	.0447	45.9	.0876
144.3	143.9	162.5	.8612	2760	.2252	.0223	.0507	44.9	.0972
137.4	137.1	143.9	.8612	2756	.2479	.0228	.0614	43.8	.1149
133.9	133.6	130.1	.8576	2752	.2606	.0222	.0679	45	.1306
123.7	123.4	114.6	.8528	2746	.3045	.0246	.0927	40.6	.1606
117.7	117.5	91	.8473	2743	.3358	.0226	.1128	44.3	.2135
112.5	112.3	84.8	.8454	2741	.3672	.024	.1349	41.7	.2398
107.4	107.2	70.9	.8388	2738	.4024	.0229	.1619	43.7	.3021

Data not reduced at TAMU because of extra drag with pressure belt and wing rake

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 74

CLEAN/PRESSURE BELT/RAKE

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	40	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
162.4	161.9	215.4	.8599	2852	.1838	.0211	.0338	47.4	.0684
158.2	157.8	201	.8603	2846	.1932	.0213	.0373	47	.0748
152.5	152.1	185.6	.8607	2825	.2063	.0219	.0426	45.6	.0828
148.5	148.1	171.2	.8611	2821	.2172	.0219	.0472	45.6	.0919
144.3	144	158.9	.8615	2818	.2298	.0222	.0528	45.1	.1016
139.2	138.9	148.1	.8607	2814	.2465	.023	.0608	43.5	.1127
135.3	135	140.3	.8586	2812	.2607	.0237	.0679	42.3	.1226
130.6	130.3	124.9	.8547	2807	.2792	.0233	.0779	42.9	.1427
124.2	124	112.1	.8512	2800	.3078	.0242	9.479999E-02	41.3	.1671
116.9	116.7	99.7	.8474999	2798	.3471	.0257	.1205	38.9	.2001
113	112.8	97.2	.8368	2794	.3709	.0274	.1376	36.5	.2145
108.5	108.3	89.5	.8345	2792	.4019	.0284	.1616	35.2	.2429

Data not reduced further at TAMU due to rake and pressure belt configuration

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 75

CLEAN/WING RAKE/BELT CUT AT T.E./FAIRING REMOVED

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	25	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
160.1	159.6	219	.8521	2860	.1896	.0225	.0359	44.4	.0682
154.3	153.9	196.4	.8528	2852	.2035	.0226	.0414	44.3	.0784
149.4	149	181.5	.8531	2748	.2091	.023	.0437	43.5	
8.120001E-02									
145.1	144.7	169.6	.8534	2844	.2293	.0234	.0526	42.7	.0958
136.6	136.3	148.6	.8517	2839	.2582	.0245	.0667	40.8	.116
131.8	131.5	133.7	.8481	2834	.2768	.0245	.0766	40.9	.1337
126.2	126	119.3	.8445	2829	.3013	.0247	.0908	40.4	.1566
119.9	119.7	107.4	.8412	2825	.3332	.0259	.111	38.7	.1832
113	112.8	97.7	.8289	2817	.3739	.0277	.1398	36.1	.2156
110.1	109.9	93.6	.8275	2815	.3936	.0286	.1549	34.9	.2311

Data not further reduced at TAMU due to rake and pressure belt configuration.

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 76

CLEAN CONFIGURATION

L/D NOT PLOTTED DUE TO RESCHEDULING OF L.G. DOORS FOR FLT 78 SUP

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	46	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
158.3	157.9	209.7	.8628	2856	.1936	.0221	.0375	45.2	
7.240001E-02									
152.1	151.7	189.7	.8632999						
				2853	.2095	.0225	.0439	44.4	.0831
147.6	147.2	175.3	.8637	2849	.2221	.0228	.0493	43.9	.0923
142.5	142.2	164.5	.8637	2842	.2376	.0238	.0564	42.1	.1014
140.4	140.1	152.2	.8644	2832	.2438	.023	.0595	43.5	.1104
134.9	134.6	140.3	.8618	2829	.2638	.0238	.0696	42	.1247
128.8	128.5	124.9	.8577	2825	.2889	.0242	.0834	41.3	.147
121.1	120.9	112.1	.8536	2819	.326	.026	.1062	38.4	.1742
118.2	118	102.8	.8514	2816	.3417	.0256	.1168	39.1	.1947
113	112.8	93.1	.8486	2813	.3734	.0264	.1394	37.8	.2252
106.4	106.2	86.4	.8365	2810	.4206	.029	.1769	34.5	.2608

Data not plotting because of landing gear door rerigging for Flight 78

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 77

NOT PLOTTED ODK LANDING GEAR DOORS

CLEAN - WING RAKE

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	43	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
159.7	159.2	215.4	.8612	2849	.1898	.0221	.036	45.2	.0695
154.8	154.4	201.5	.8615	2845	.2017	.0227	.0407	44	.0764
151.2	150.8	187.1	.8619	2841	.2111	.0227	.0445	44.1	.0839
148.5	148.1	175.8	.8623	2834	.2182	.0225	.0476	44.5	
9.039999E-02									
145.1	144.7	168.1	.8624	2829	.2281	.023	.052	43.4	.0964
140.9	140.6	156.8	.8627	2824	.2414	.0235	.0583	42.6	.106
135.6	135.3	141.9	.8606	2812	.2595	.0238	.0673	42.1	.121
130.4	130.1	124.4	.8562	2805	.2798	.0233	.0783	42.9	.1435
126.4	126.2	115.7	.8539	2800	.2972	.0237	.0884	42.2	.159
120.3	120.1	105.4	.8508	2796	.3276	.025	.1073	40.1	.1835
113.4	113.2	95.6	.8474	2792	.368	.0269	.1354	37.2	.2149
108.6	108.4	91	.8362	2790	.4009	.0288	.1607	34.8	.2385

Data not plotted due to Landing gear door rerigging on Flight 78

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 79

CLEAN BASELINE VERIFICATION

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
9000	34	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
158.4	157.9	212.8	.8567	2856	.1935	.0221	.0375	45.3	7.240001E-02
150.2	149.8	185.6	.8574	2846	.2144	.0226	.046	44.2	.0868
147.6	147.2	169.6	.8581	2838	.2213	.0218	.049	45.9	.096
143.8	143.4	157.3	.8585	2836	.233	.0218	.0543	45.8	.1061
138.3	138	142.9	.8576	2828	.2511	.0223	.063	44.9	.1208
134.4	134.1	131.1	.8545	2826	.2656	.0222	.0705	45.1	.1358
128.8	128.5	122.9	.8521	2822	.2887	.0235	.0833	42.5	.1511
124.6	124.3	112.6	.8493	2818	.308	.0237	.0949	42.1	.1706
122	121.7	104.4	.8474	2815	.3209	.0234	.103	42.8	.1879
115.1	114.9	93.6	.8441	2810	.3597	.0249	.1294	40.2	.2222
107.6	107.4	88.4	.832	2806	.4109	.0283	.1688	35.3	.2545

Data not plotted at TAMU.
Bad torquemeter discovered later
and replaced on 91 and subsequent.

MODEL M20K

FLT NO: 80

CLEAN BASELINE VERIFICATION

Not Used
DJH
Temperature Erratic
(TIT): Door Stop
Broke

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
7500	47	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
158.2	157.8	210.3	.8632999						
				2848	.1933	.0224	.0374	44.6	.0712
152.9	152.5	192.3	.8638	2846	.2067	.0227	.0427	44.1	.0804
146.8	146.5	168.6	.8646	2842	.2239	.0225	.0501	44.5	.0951
143.5	143.2	161.9	.8646	2835	.2336	.0231	.0546	43.3	.1008
137.9	137.6	148.1	.8637	2831	.2526	.0238	.0638	42	.1145
130.5	130.3	132.1	.8592	2826	.2814	.0249	.0792	40.2	.1358
125.1	124.9	114.6	.8549	2823	.3059	.0244	.0936	41	.1638
119.5	119.3	106.9	.8523	2819	.3346	.026	.112	38.5	.1838

Data not plotted.
Bad torquemeter + TIT problem.

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 82

BASE LINE VERIFICATION

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	29	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
163.4	162.9	213.3	.8544	2852	.1815	.0206	.033	48.5	.0683
157.2	156.8	187.1	.8553	2841	.1953	.0203	.0381	49.2	.0802
153.5	153.1	178.4	.8556	2818	.2031	.0208	.0413	48.1	
8.470001E-02									
148.5	148.1	167.6	.8559	2812	.2165	.0216	.0469	46.3	.0928
143	142.7	143.9	.8538	2805	.2329	.0207	.0542	48.3	.1119
138.7	138.4	136.2	.8517999						
				2800	.247	.0214	.061	46.7	.1217
134.5	134.2	123.4	.8487	2796	.2623	.0212	.0688	47.2	.1386
124.1	123.9	105.4	.844	2771	.3051	.0229	9.309999E-02		
								43.7	.1737
113.2	113	98.2	.8312	2765	.3658	.0276	.1338	36.2	.2066

Data not plotted at TAMU
due to bad torquemeter.

MODEL M20K

FLT NO: 83

CLEAN BASE LINE VERIFICATION

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	34	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
164.3	163.8	215.4	.8569	2854	.1797	.0204	.0323	49	.0675
160.7	160.2	200.5	.8573	2850	.1875	.0203	.0352	49.2	.0739
156.3	155.9	186.6	.8578	2846	.1979	.0206	.0392	48.6	.0813
151.7	151.3	174.3	.8582	2842	.2097	.021	.044	47.6	.0894
146.8	146.4	160.4	.8587	2838	.2236	.0213	.05	46.9	.1001
142.4	142.1	147.5	.8575	2835	.2373	.0215	.0563	46.6	.1121
138.7	138.4	135.2	.8544	2832	.2498	.0212	.0624	47.2	.1257
133.7	133.4	128	.8524	2829	.2685	.0223	.0721	44.8	.1378
129.5	129.2	119.8	.8503	2827	.286	.023	.0818	43.6	.1521
~~126.8~~	~~126.6~~	~~78.7~~	~~.8405~~	~~2817~~	~~.2972~~	~~.0159~~	~~.0883~~	~~63~~	~~.2375~~
~~120.6~~	~~120.4~~	~~63.2~~	~~.0154~~	~~2313~~	~~.3279~~	~~.0003~~	~~.1075~~	~~3677.5~~	
									~~16.0853~~
~~116.1~~	~~115.9~~	~~60.7~~	~~.8043~~	~~2810~~	~~.3534~~	~~.0153~~	~~.1249~~	~~65.6~~	~~.3497~~
~~114.1~~	~~113.9~~	~~51.9~~	~~.7814~~	~~2808~~	~~.3656~~	~~.0133~~	~~.1337~~	~~74.9~~	~~.4277~~
~~105.6~~	~~105.4~~	~~47.8~~	~~.7767~~	~~2805~~	~~.4262~~	~~.0154~~	~~.1817~~	~~64.9~~	~~.5036~~

3rd Measurement

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 89

CLEAN WITH FEATHERFILL

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	61	174.786	36.1

(14)

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
159.9	159.4	206.2	.87	2856	.1898	.021	.036	47.7	.0734
154.7	154.3	188.7	.8704999	2842	.2017	.0212	.0407	47.2	.082
152.2	151.8	180.4	.8707	2836	.2079	.0213	.0432	47	.0868
147.6	147.2	169.1	.871	2829	.2205	.0219	.0486	45.8	.095
142.9	142.6	151.7	.8717	2815	.234	.0216	.0548	46.3	.1082
137.7	137.4	142.4	.8709	2809	.2514	.0226	.0632	44.2	.1192
134.4	134.1	133.7	.8685	2805	.2635	.0228	.0694	43.9	.13
129.8	129.5	119.8	.8647	2801	.282	.0226	.0795	44.3	.1504
125.4	125.2	113.1	.8627	2795	.3015	.0236	9.089999E-02	42.4	.1646
119.4	119.2	103.8	.8596999	2790	.3318	.025	.1101	40.1	.1883
116.5	116.3	97.7	.8579	2786	.348	.0252	.1211	39.6	.2049
112.4	112.2	91.5	.8551	2783	.3734	.0262	.1394	38.1	.227
109	108.8	89.5	.8437	2779	.3964	.0277	.1571	36	.2418
105.2	105	85.9	.841	2775	.4249	.0295	.1805	33.9	.2611

MODEL M20K

FLT NO: 91

CLEAN - FEATHERFILL

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8500	47	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
162.6	162.1	214.9	.8631	2858	.1838	.0207	.0338	48.3	.0696
159.9	159.4	204.6	.8634	2848	.1893	.0207	.0359	48.2	.0738
156.3	155.8	190.2	.8639	2843	.1978	.0206	.0391	48.4	.0809
153.1	152.7	178.9	.8642	2828	.205	.0207	.042	48.4	.0868
148.5	148.1	172.7	.8643	2824	.2175	.0218	.0473	45.8	.0925
142.9	142.5	160.4	.8645	2820	.2345	.0228	.055	43.9	.1031
139	138.7	150.1	.8648	2811	.247	.0231	.061	43.2	.1125
135.3	135	133.7	.8617	2787	.2584	.0223	.0668	44.9	.128
128.5	128.2	117.7	.8574	2785	.2862	.0228	.0819	43.9	.1536
119.8	119.6	103.8	.8532	2783	.3289	.0246	.1081	40.6	.1875
114.1	113.9	91	.8498	2780	.362	.0249	.1311	40.2	.2249
106.9	106.7	84.8	.8375	2773	.4113	.0278	.1691	36	.26

FEATHERFILLED WINGS, FREE TRANSITION, FLT 91

5-29-84

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0192			0.0192		
0.1838	0.0338	0.0207	0.0011	0.0007	0.0208	1.49E-08	4.24E-05
0.1893	0.0358	0.0207	0.0013	0.0007	0.0209	4.98E-08	4.11E-05
0.1978	0.0391	0.0206	0.0015	0.0008	0.0211	2.35E-07	3.90E-05
0.2050	0.0420	0.0207	0.0018	0.0009	0.0212	2.79E-07	3.73E-05
0.2175	0.0473	0.0218	0.0022	0.0010	0.0215	9.74E-08	3.42E-05
0.2345	0.0550	0.0228	0.0030	0.0013	0.0219	8.72E-07	2.99E-05
0.2470	0.0610	0.0231	0.0037	0.0014	0.0222	8.79E-07	2.67E-05
0.2584	0.0668	0.0223	0.0045	0.0015	0.0224	2.13E-08	2.39E-05
0.2862	0.0819	0.0228	0.0067	0.0019	0.0232	1.53E-07	1.72E-05
0.3289	0.1082	0.0246	0.0117	0.0027	0.0245	1.33E-08	8.12E-06
0.3620	0.1310	0.0249	0.0172	0.0033	0.0256	5.05E-07	2.97E-06
0.4113	0.1692	0.0278	0.0286	0.0047	0.0275	9.79E-08	2.37E-08
						3.22E-06	3.03E-04

Straight Line Fit Statistics

$C_D = .019159 + .049237C_L^2$

Mean = 2.273333333333E-02

SEE = 5.672263420439E-04

(SEE = Standard Error of Estimate)

MODEL M20K

FLT NO: 92

CLEAN - FEATHERFILL

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	48	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
163	162.5	213.3	.8638	2848	.1822	.0206	.0332	48.6	.0688
159	158.6	197.4	.8642	2843	.1911	.0205	.0365	48.7	
7.590001E-02									
155.8	155.4	185.6	.8646	2836	.1985	.0205	.0394	48.7	.082
151.7	151.3	178.9	.8648	2825	.2085	.0214	.0435	46.7	.0866
147.2	146.8	164	.8652	2820	.221	.0215	.0488	46.5	.097
143.3	143	150.6	.8657	2816	.2328	.0214	.0542	46.7	.1081
138.2	137.9	139.8	.8632999						
				2807	.2494	.0221	.0622	45.3	.1203
132.8	132.5	127.5	.8599	2802	.2696	.0226	.0727	44.3	.1373
129.4	129.1	120.3	.858	2796	.2833	.023	.0802	43.5	.149
125	124.8	113.1	.8558	2792	.3031	.0239	9.179999E-02		
								41.8	.164
121.1	120.9	108	.8541	2787	.3223	.025	.1038	39.9	.177
118.6	118.4	101.8	.8525	2782	.3353	.0251	.1125	39.9	.1914
114.1	113.9	95.1	.8502	2780	.362	.0262	.131	38.1	.2132
108.1	107.9	87.4	.8382	2774	.4023	.0279	.1618	35.8	.2473
104.7	104.5	83.3	.8366	2772	.4285	.0292	.1836	34.2	.268

FEATHERFILLED WINGS, FREE TRANSITION, FLT 92

5-30-84

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0185			0.0185		
0.1822	0.0332	0.0206	0.0011	0.0007	0.0204	2.90E-08	8.78E-06
0.1911	0.0365	0.0205	0.0013	0.0007	0.0206	1.56E-08	7.66E-06
0.1985	0.0394	0.0205	0.0016	0.0008	0.0208	8.64E-08	6.76E-06
0.2085	0.0435	0.0214	0.0019	0.0009	0.0210	1.35E-07	5.57E-06
0.2210	0.0488	0.0215	0.0024	0.0011	0.0213	2.32E-08	4.18E-06
0.2328	0.0542	0.0214	0.0029	0.0012	0.0217	6.86E-08	3.00E-06
0.2494	0.0622	0.0221	0.0039	0.0014	0.0221	9.99E-10	1.59E-06
0.2696	0.0727	0.0226	0.0053	0.0016	0.0227	2.15E-08	4.18E-07
0.2833	0.0803	0.0230	0.0064	0.0018	0.0232	3.66E-08	4.09E-08
0.3031	0.0919	0.0239	0.0084	0.0022	0.0239	7.59E-10	2.30E-07
0.3223	0.1039	0.0250	0.0108	0.0026	0.0246	1.79E-07	1.40E-06
0.3353	0.1124	0.0251	0.0126	0.0028	0.0251	4.58E-10	2.84E-06
0.3620	0.1310	0.0262	0.0172	0.0034	0.0262	8.41E-10	7.72E-06
0.4023	0.1618	0.0279	0.0262	0.0045	0.0280	6.13E-09	2.10E-05
0.4285	0.1836	0.0292	0.0337	0.0054	0.0293	3.07E-09	3.44E-05
						6.07E-07	1.06E-04

Straight Line Fit Statistics

$C_D = .018482 + .058675C_L^2$

Mean = 2.339333333333E-02

SEE = 2.160611508529E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 93

CLEAN - FEATHERFILL

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	55	174.786	36.1

(10)

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
161.6	161.1	210.8	.8671	2849	.1854	.0208	.0344	48	.0705
157.2	156.8	191.8	.8675999						
				2844	.1955	.0206	.0382	48.6	.0793
153.6	153.2	183	.8679	2834	.204	.021	.0416	47.5	.0845
147.9	147.5	167.1	.8684	2825	.2193	.0215	.0481	46.5	.0954
143.6	143.3	154.2	.8688	2818	.232	.0217	.0538	46.1	.1059
140.7	140.4	141.4	.8677	2812	.2411	.0211	.0581	47.3	.1175
124.1	123.9	111	.8589	2801	.3084	.0239	.0951	41.8	.17
117	116.8	100.2	.8553999						
				2792	.3458	.0256	.1196	39	.1992
~~113.7~~	~~113.5~~	~~89.5~~	~~.853~~	~~2790~~	~~.3658~~	~~.0249~~	~~.1338~~	~~40.2~~	~~.2298~~
103.1	103	83.3	.8389	2784	.4438	.0305	.1969	32.8	.2756
132.7	132.4	126	.8632999						
				2806	.2704	.0223	.0731	44.8	.1398

FEATHERFILLED WINGS, FREE TRANSITION, FLT 93

6-15-84

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0184			0.0184		
0.1854	0.0344	0.0208	0.0012	0.0007	0.0204	1.86E-07	7.36E-06
0.1955	0.0382	0.0206	0.0015	0.0008	0.0206	6.88E-11	6.20E-06
0.2040	0.0416	0.0210	0.0017	0.0009	0.0208	4.47E-08	5.26E-06
0.2193	0.0481	0.0215	0.0023	0.0010	0.0212	1.13E-07	3.68E-06
0.2320	0.0538	0.0217	0.0029	0.0012	0.0215	4.15E-08	2.51E-06
0.2411	0.0581	0.0211	0.0034	0.0012	0.0217	4.17E-07	1.78E-06
0.2704	0.0731	0.0223	0.0053	0.0016	0.0226	9.90E-08	2.18E-07
0.3084	0.0951	0.0239	0.0090	0.0023	0.0239	1.05E-10	6.53E-07
0.3458	0.1196	0.0256	0.0143	0.0031	0.0253	8.52E-08	4.96E-06
0.3658	0.1338	0.0249	0.0179	0.0033	0.0261	1.52E-06	9.31E-06
0.4438	0.1970	0.0305	0.0388	0.0060	0.0298	4.98E-07	4.51E-05
						3.01E-06	8.70E-05

Straight Line Fit Statistics

$C_D = .018376 + .057972C_L^2$

Mean = 2.308181818182E-02

SEE = 5.779071572223E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 105

FEATHERFILL - 5% TRIPPER STRIPS

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	56	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
156.3	155.9	209.7	.8674	2858	.1987	.0229	.0395	43.8	.0738
151.9	151.5	188.2	.8681	2842	.2092	.0224	.0438	44.7	.0836
148.8	148.4	178.9	.8683	2834	.2174	.0226	.0472	44.2	.0892
143.2	142.9	167.1	.8683	2827	.234	.0237	.0548	42.2	.0987
138.4	138.1	150.6	.8689	2818	.2497	.0236	.0623	42.3	.1125
134.9	134.6	140.9	.8674	2812	.2622	.0238	.0688	41.9	.1231
129.6	129.3	132.1	.8646	2803	.2831	.0251	.0801	39.8	.1362
125.6	125.4	123.4	.862	2796	.3006	.0257	9.039999E-02		
								38.9	.1501
121.5	121.3	115.7	.8595	2786	.32	.0265	.1024	37.7	.1648
116.5	116.3	106.9	.8474	2777	.3469	.0274	.1203	36.5	.1874
108.1	107.9	96.1	.843	2757	.3998	.0307	.1599	32.6	.2226
104.7	104.5	92.5	.8404	2751	.4252	.0324	.1808	30.9	.2385
112.8	112.6	101.8	.8456	2772	.3693	.0287	.1364	34.9	.203

FEATHERFILLED WINGS, TRANSITION FIXED AT 0.05C, FLT 105

7-3-84

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0195			0.0195		
0.1987	0.0395	0.0229	0.0016	0.0009	0.0222	4.59E-07	1.29E-05
0.2092	0.0438	0.0224	0.0019	0.0010	0.0225	1.41E-08	1.08E-05
0.2174	0.0473	0.0226	0.0022	0.0011	0.0228	2.59E-08	9.28E-06
0.2340	0.0548	0.0237	0.0030	0.0013	0.0233	1.77E-07	6.39E-06
0.2497	0.0624	0.0236	0.0039	0.0015	0.0238	4.21E-08	4.01E-06
0.2622	0.0687	0.0238	0.0047	0.0016	0.0242	2.01E-07	2.43E-06
0.2831	0.0801	0.0251	0.0064	0.0020	0.0250	3.99E-09	5.94E-07
0.3006	0.0904	0.0257	0.0082	0.0023	0.0257	1.91E-09	4.09E-09
0.3200	0.1024	0.0265	0.0105	0.0027	0.0266	5.93E-09	5.92E-07
0.3469	0.1203	0.0274	0.0145	0.0033	0.0278	1.75E-07	4.04E-06
0.3693	0.1364	0.0287	0.0186	0.0039	0.0289	5.24E-08	9.74E-06
0.3998	0.1598	0.0307	0.0255	0.0049	0.0306	2.18E-08	2.25E-05
0.4252	0.1808	0.0324	0.0327	0.0059	0.0320	1.58E-07	3.84E-05
						1.34E-06	1.22E-04

Straight Line Fit Statistics

$C_D = .019490 + .069209C_L^2$

Mean = 2.580769230769E-02

SEE = 3.487360128711E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 108

FEATHERFILL - 5% STRIPS (SINGLE LAYER)

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	56	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
159	158.6	212.8	.8675	2856	.1919	.022	.0368	45.4	.0714
152.3	151.9	191.8	.8679	2748	.2012	.0226	.0405	44.2	.0765
147.9	147.5	178.4	.8682	2841	.2205	.023	.0486	43.6	.0905
144.9	144.5	168.1	.8685	2834	.2292	.023	.0525	43.5	9.749999E-02
140.7	140.4	155.3	.8689	2829	.2426	.0232	.0588	43.1	.1082
134.9	134.6	142.9	.8679	2820	.2629	.0242	.0691	41.3	.122
130.5	130.2	133.7	.8651	2817	.2806	.0249	.0787	40.1	.1349
125.6	125.4	120.8	.8616	2814	.3025	.0251	.0915	39.8	.1554
121.4	121.2	115.7	.8595	2811	.3234	.0266	.1046	37.6	.1679
116.1	115.9	108	.8474999	2807	.353	.028	.1246	35.7	.1902
113.7	113.5	102.8	.846	2801	.3673	.0283	.1349	35.3	.2035
106.5	106.3	97.2	.842	2797	.4179	.0324	.1746	30.9	.2302

FEATHERFILLED WINGS, TRANSITION FIXED AT 0.05C, FLT 108

7-6-84

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0193			0.0193		
0.1919	0.0368	0.0220	0.0014	0.0008	0.0219	1.24E-08	1.15E-05
0.2012	0.0405	0.0226	0.0016	0.0009	0.0221	2.05E-07	9.78E-06
0.2205	0.0486	0.0230	0.0024	0.0011	0.0227	7.61E-08	6.51E-06
0.2292	0.0525	0.0230	0.0028	0.0012	0.0230	1.99E-12	5.17E-06
0.2426	0.0589	0.0232	0.0035	0.0014	0.0234	6.22E-08	3.33E-06
0.2629	0.0691	0.0242	0.0048	0.0017	0.0242	5.51E-10	1.21E-06
0.2806	0.0787	0.0249	0.0062	0.0020	0.0249	1.75E-09	1.74E-07
0.3025	0.0915	0.0251	0.0084	0.0023	0.0258	4.40E-07	2.38E-07
0.3234	0.1046	0.0266	0.0109	0.0028	0.0267	8.09E-09	2.00E-06
0.3530	0.1246	0.0280	0.0155	0.0035	0.0281	1.18E-08	8.03E-06
0.3673	0.1349	0.0283	0.0182	0.0038	0.0288	2.90E-07	1.27E-05
0.4179	0.1746	0.0324	0.0305	0.0057	0.0317	5.57E-07	4.07E-05
						1.66E-06	1.01E-04

Straight Line Fit Statistics

$C_D = .019279 + .070859C_L^2$

Mean = 2.527500000000E-02

SEE = 4.079336319796E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 109

5% STRIPS (FEATHERFILL)

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	57	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
159	158.6	212.8	.8679	2853	.1917	.022	.0368	45.4	.0713
152.3	151.9	193.3	.8683	2843	.2082	.0228	.0433	43.9	.0813
148.8	148.4	176.8	.8689	2831	.2171	.0223	.0471	44.8	.0901
142.3	142	164	.8689	2827	.237	.0237	.0562	42.2	.1013
138.5	138.2	152.7	.8692	2816	.2491	.0239	.0621	41.8	.1108
134.9	134.6	142.4	.8683	2807	.2617	.0241	.0685	41.5	.1213
132.3	132	135.7	.8664	2801	.2715	.0243	.0737	41.2	.1296
127	126.8	126	.8634	2791	.2935	.0254	.0861	39.4	.1448
122.3	122.1	116.7	.8605	2788	.3161	.0262	.0999	38.1	.1625
116.5	116.3	108.5	.8481999						
				2783	.3476	.0278	.1208	36	.1855
114.1	113.9	101.8	.8465	2780	.362	.0277	.131	36.1	.2018
108.1	107.9	94.6	.8433	2776	.4026	.0302	.1621	33.2	.2294

FEATHERFILLED WINGS, TRANSITION FIXED AT 0.05C, FLT 109

7-9-84

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0198			0.0198		
0.1917	0.0367	0.0220	0.0014	0.0008	0.0221	1.52E-08	8.47E-06
0.2082	0.0433	0.0228	0.0019	0.0010	0.0225	6.52E-08	6.19E-06
0.2171	0.0471	0.0223	0.0022	0.0011	0.0228	2.37E-07	5.05E-06
0.2370	0.0562	0.0237	0.0032	0.0013	0.0234	1.13E-07	2.79E-06
0.2491	0.0621	0.0239	0.0039	0.0015	0.0237	2.59E-08	1.67E-06
0.2617	0.0685	0.0241	0.0047	0.0017	0.0242	2.53E-09	7.80E-07
0.2715	0.0737	0.0243	0.0054	0.0018	0.0245	3.39E-08	3.02E-07
0.2935	0.0861	0.0254	0.0074	0.0022	0.0253	1.49E-08	5.98E-08
0.3161	0.0999	0.0262	0.0100	0.0026	0.0262	1.78E-09	1.26E-06
0.3476	0.1208	0.0278	0.0146	0.0034	0.0275	9.42E-08	6.05E-06
0.3620	0.1310	0.0277	0.0172	0.0036	0.0281	1.99E-07	9.69E-06
0.4026	0.1621	0.0302	0.0263	0.0049	0.0301	5.11E-09	2.60E-05
						8.07E-07	6.83E-05

Straight Line Fit Statistics

$C_D = .019776 + .063870C_L^2$

Mean = 2.503333333333E-02

SEE = 2.840921065350E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 110

10% TRIPPER STRIPS (FEATHERFILL)

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	58	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
158.1	157.7	210.8	.8684	2854	.194	.0222	.0376	45.1	
'.240001E-02									
152.3	151.9	192.8	.8688	2845	.2083	.0227	.0434	44.1	.0816
149.2	148.8	179.4	.8692	2837	.2164	.0225	.0468	44.5	.089
144.1	143.8	168.6	.8693	2830	.2314	.0234	.0535	42.7	
9.749999E-02									
138	137.7	153.2	.8698	2825	.2518	.0242	.0634	41.2	.1116
133.6	133.3	139.3	.868	2818	.2679	.0242	.0718	41.3	.1264
127.9	127.6	129.6	.8648	2812	.2916	.0256	.085	39.1	.1418
125.7	125.5	125.4	.8634	2805	.3011	.026	.0907	38.4	.1486
122.3	122.1	117.7	.8611	2801	.3176	.0265	.1008	37.8	.1627
115.8	115.6	109	.8486	2798	.3537	.0284	.1251	35.2	.1879
113.7	113.5	100.2	.8466	2794	.3664	.0275	.1342	36.3	.208
107.7	107.5	92.5	.843	2791	.4078	.0298	.1663	33.6	.2384

FEATHERFILLED WINGS, TRANSITION FIXED AT 0.10c, FLT 110

7-10-84

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0201			0.0201		
0.1940	0.0376	0.0222	0.0014	0.0008	0.0224	4.35E-08	8.07E-06
0.2083	0.0434	0.0227	0.0019	0.0010	0.0228	2.95E-09	6.23E-06
0.2164	0.0468	0.0225	0.0022	0.0011	0.0230	2.13E-07	5.24E-06
0.2314	0.0535	0.0234	0.0029	0.0013	0.0234	1.23E-09	3.55E-06
0.2518	0.0634	0.0242	0.0040	0.0015	0.0240	5.88E-08	1.67E-06
0.2679	0.0718	0.0242	0.0052	0.0017	0.0245	6.78E-08	6.23E-07
0.2916	0.0850	0.0256	0.0072	0.0022	0.0253	1.17E-07	5.67E-11
0.3011	0.0907	0.0260	0.0082	0.0024	0.0256	1.63E-07	1.20E-07
0.3176	0.1009	0.0265	0.0102	0.0027	0.0262	8.43E-08	9.21E-07
0.3537	0.1251	0.0284	0.0157	0.0036	0.0277	5.38E-07	5.84E-06
0.3664	0.1342	0.0275	0.0180	0.0037	0.0282	5.13E-07	8.80E-06
0.4078	0.1663	0.0298	0.0277	0.0050	0.0301	1.18E-07	2.39E-05

Straight Line Fit Statistics

$C_D = .020146 + .060114C_L^2$

Mean = 2.525000000000E-02

SEE = 4.382195545228E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 111

10% STRIPS (FEATHERFILL)

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	59	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
158.1	157.7	210.3	.8689	2858	.1943	.0221	.0377	45.2	.0728
151.9	151.5	190.7	.8693	2852	.2099	.0226	.0441	44.2	.0832
149.2	148.8	179.4	.8697	2847	.2172	.0225	.0472	44.5	.0897
144.9	144.5	168.6	.8699	2843	.2299	.023	.0528	43.4	
790001E-02									
139.8	139.5	151.7	.8704	2839	.2466	.0231	.0608	43.3	.1124
134.4	134.1	143.9	.8696	2833	.2661	.0246	.0708	40.6	.1228
130.1	129.8	131.6	.8662	2830	.2836	.0247	.0805	40.5	.139
124.9	124.7	118.8	.8626	2827	.3073	.0251	.0945	39.8	.1607
119.8	119.6	110	.8596999						
				2826	.3339	.0262	.1115	38.1	.1814
113.7	113.5	103.8	.8477	2822	.37	.0285	.1369	35	.2048
109	108.8	96.6	.8443	2820	.4023	.03	.1618	33.3	.2301

FEATHERFILLED WINGS, TRANSITION FIXED AT 0.10c, FLT 111

7-10-84

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0196			0.0196		
0.1943	0.0378	0.0221	0.0014	0.0008	0.0220	1.14E-08	7.67E-06
0.2099	0.0441	0.0226	0.0019	0.0010	0.0224	4.37E-08	5.63E-06
0.2172	0.0472	0.0225	0.0022	0.0011	0.0226	7.66E-09	4.74E-06
0.2299	0.0529	0.0230	0.0028	0.0012	0.0229	2.96E-09	3.31E-06
0.2466	0.0608	0.0231	0.0037	0.0014	0.0234	1.21E-07	1.73E-06
0.2661	0.0708	0.0246	0.0050	0.0017	0.0241	2.73E-07	4.71E-07
0.2836	0.0804	0.0247	0.0065	0.0020	0.0247	2.49E-10	6.31E-09
0.3073	0.0944	0.0251	0.0089	0.0024	0.0256	2.18E-07	6.46E-07
0.3339	0.1115	0.0262	0.0124	0.0029	0.0266	1.96E-07	3.53E-06
0.3700	0.1369	0.0285	0.0187	0.0039	0.0282	6.51E-08	1.21E-05
0.4023	0.1618	0.0300	0.0262	0.0049	0.0298	3.32E-08	2.55E-05
						9.72E-07	6.54E-05

Straight Line Fit Statistics

$C_D = .019613 + .063052 C_L^2$

Mean = 2.501739130435E-02

SEE = 3.286254724339E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 113

25% STRIPS - FEATHERFILL

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
9000	53	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
160.7	160.2	211.3	.8659	2830	.1864	.0208	.0347	48	.0711
155.4	154.9	194.8	.8664	2822	.1987	.0213	.0395	47.1	.0793
152.8	152.3	186.1	.8667	2814	.2049	.0214	.042	46.8	.0839
149.2	148.8	174.8	.867	2797	.2135	.0215	.0456	46.4	.0903
144.9	144.5	164.5	.8672	2791	.2258	.0221	.051	45.2	9.839999E-02
140.7	140.3	152.2	.8675999	2786	.239	.0224	.0571	44.7	.109
135.4	135.1	142.9	.8675999	2780	.2574	.0236	.0663	42.5	.1201
130	129.7	132.1	.8646	2773	.2785	.0245	.0776	40.8	.1351
126.5	126.2	120.8	.8616	2768	.2935	.0242	.0862	41.3	.1518
121.5	121.3	111	.8586	2764	.3176	.025	.1009	40	.1721
118.2	118	101.8	.8562	2760	.3351	.0249	.1123	40.2	.1928
112.4	112.2	96.6	.8444	2757	.37	.027	.1369	37	.2162
108.5	108.3	90.5	.8423	2755	.3968	.0281	.1574	35.6	.2393

FEATHERFILLED WINGS, TRANSITION FIXED AT 0.25c, FLT 113

7-11-84

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0192			0.0192		
0.1864	0.0347	0.0208	0.0012	0.0007	0.0212	1.25E-07	5.98E-06
0.1987	0.0395	0.0213	0.0016	0.0008	0.0214	1.57E-08	4.73E-06
0.2049	0.0420	0.0214	0.0018	0.0009	0.0216	2.84E-08	4.13E-06
0.2135	0.0456	0.0215	0.0021	0.0010	0.0218	7.52E-08	3.33E-06
0.2258	0.0510	0.0221	0.0026	0.0011	0.0221	2.72E-10	2.30E-06
0.2390	0.0571	0.0224	0.0033	0.0013	0.0224	1.20E-09	1.36E-06
0.2574	0.0663	0.0236	0.0044	0.0016	0.0230	4.13E-07	4.13E-07
0.2785	0.0776	0.0245	0.0060	0.0019	0.0236	8.02E-07	1.82E-11
0.2935	0.0861	0.0242	0.0074	0.0021	0.0241	1.10E-08	2.45E-07
0.3176	0.1009	0.0250	0.0102	0.0025	0.0249	3.85E-09	1.79E-06
0.3351	0.1123	0.0249	0.0126	0.0028	0.0256	4.78E-07	3.97E-06
0.3700	0.1369	0.0270	0.0187	0.0037	0.0270	9.50E-14	1.16E-05
0.3968	0.1575	0.0281	0.0248	0.0044	0.0282	5.72E-09	2.09E-05
						1.96E-06	6.07E-05

Straight Line Fit Statistics

$C_D = .019166 + .057222 C_L^2$

Mean = 2.360000000000E-02

SEE = 4.221699479685E-04

(SEE = Standard Error of Estimate)

C-2

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 114

25% STRIPS (FEATHERFILL)

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	55	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
160.7	160.2	211.8	.8671	2851	.1876	.0213	.0352	47	.0707
156.3	155.9	193.8	.8675999						
				2842	.1976	.0211	.0391	47.3	.0788
151.9	151.5	179.9	.868	2834	.2086	.0214	.0435	46.8	
689999E-02 (.0869)									
147.2	146.8	169.6	.8682	2830	.2218	.0222	.0492	45.1	
7.479999E-02									
144.1	143.8	158.9	.8686	2826	.231	.0221	.0534	45.2	.103
139.8	139.5	149.1	.8688	2820	.2449	.0227	.06	44	.1126
136.2	135.9	138.3	.8665	2817	.2577	.0227	.0664	44	.1247
129.6	129.3	126	.8629	2814	.2842	.0239	.0808	41.8	.1441
126.5	126.3	116.2	.8604	2811	.2979	.0237	.0888	42.3	.1602
121.8	121.6	112.1	.8586	2808	.321	.0255	.103	39.2	.1724
117.4	117.2	104.9	.8560999						
				2804	.3449	.0266	.119	37.6	.1911
113.2	113	97.7	.8446	2802	.3707	.0272	.1374	36.7	.2154
108.1	107.9	92	.8422	2800	.4061	.0294	.1649	34.1	.2398

FEATHERFILLED WINGS, TRANSITION FIXED AT 0.25c, FLT 114

7-12-84

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0188			0.0188		
0.1876	0.0352	0.0213	0.0012	0.0007	0.0210	9.20E-08	8.03E-06
0.1976	0.0390	0.0211	0.0015	0.0008	0.0212	1.97E-08	6.71E-06
0.2086	0.0435	0.0214	0.0019	0.0009	0.0215	1.52E-08	5.32E-06
0.2218	0.0492	0.0222	0.0024	0.0011	0.0219	1.01E-07	3.79E-06
0.2310	0.0534	0.0221	0.0028	0.0012	0.0221	2.18E-09	2.84E-06
0.2449	0.0600	0.0227	0.0036	0.0014	0.0226	1.81E-08	1.60E-06
0.2557	0.0654	0.0227	0.0043	0.0015	0.0229	4.31E-08	8.52E-07
0.2842	0.0808	0.0239	0.0065	0.0019	0.0239	3.40E-10	2.58E-09
0.2979	0.0887	0.0237	0.0079	0.0021	0.0244	4.71E-07	3.09E-07
0.3210	0.1030	0.0255	0.0106	0.0026	0.0253	4.36E-08	2.13E-06
0.3449	0.1190	0.0266	0.0142	0.0032	0.0263	9.08E-08	6.09E-06
0.3707	0.1374	0.0272	0.0189	0.0037	0.0275	7.15E-08	1.32E-05
0.4061	0.1649	0.0294	0.0272	0.0048	0.0292	3.69E-08	2.89E-05
						1.00E-06	7.98E-05

Straight Line Fit Statistics

$C_D = .018769 + .063298 C_L^2$

Mean = 3.022601394183E-04

SEE = 2.383076923077E-02

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 115

25% STRIPS - FEATHERFILL

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	55	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
160.7	160.2	212.3	.8672	2854	.1878	.0213	.0353	46.9	.0706
156.3	155.9	192.8	.8675999						
				2849	.1981	.021	.0393	47.5	.0796
151.9	151.5	178.4	.8681	2845	.2094	.0212	.0439	47.1	.0883
147.2	146.8	165.5	.8684	2842	.2227	.0216	.0496	46.2	
.790001E-02									
142.8	142.5	157.8	.8685	2838	.2363	.0226	.0558	44.3	.1055
139	138.7	143.4	.868	2835	.249	.0222	.062	45	.1191
134.4	134.1	131.1	.8647	2833	.2661	.0224	.0708	44.7	.1351
129.4	129.1	121.8	.862	2829	.2866	.0232	.0821	43.1	.151
126.1	125.9	114.6	.86	2824	.3012	.0235	.0907	42.5	.1645
121.8	121.6	110	.8582	2822	.3226	.025	.1041	40	.1775
119.1	118.9	104.4	.8566	2819	.337	.0254	.1135	39.4	.1912
113.2	113	95.1	.8534	2818	.3728	.0268	.139	37.3	.2215
109	108.8	88.4	.8421	2815	.4016	.0275	.1612	36.4	.2502

FEATHERFILLED WINGS, TRANSITION FIXED AT 0.25c, FLT 115

7-12-84

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0190			0.0190		
0.1878	0.0353	0.0213	0.0012	0.0008	0.0209	1.41E-07	5.97E-06
0.1981	0.0392	0.0211	0.0015	0.0008	0.0211	1.53E-09	4.97E-06
0.2094	0.0438	0.0212	0.0019	0.0009	0.0214	3.50E-08	3.93E-06
0.2227	0.0496	0.0216	0.0025	0.0011	0.0217	9.31E-09	2.80E-06
0.2363	0.0558	0.0226	0.0031	0.0013	0.0220	3.22E-07	1.79E-06
0.2490	0.0620	0.0222	0.0038	0.0014	0.0224	2.71E-08	1.01E-06
0.2661	0.0708	0.0224	0.0050	0.0016	0.0228	1.93E-07	2.81E-07
0.2886	0.0833	0.0232	0.0069	0.0019	0.0235	9.66E-08	2.01E-08
0.3012	0.0907	0.0235	0.0082	0.0021	0.0239	1.69E-07	2.93E-07
0.3226	0.1041	0.0250	0.0108	0.0026	0.0246	1.37E-07	1.59E-06
0.3370	0.1136	0.0254	0.0129	0.0029	0.0251	6.70E-08	3.14E-06
0.3728	0.1390	0.0268	0.0193	0.0037	0.0265	8.44E-08	9.86E-06
0.4016	0.1613	0.0275	0.0260	0.0044	0.0277	4.43E-08	1.88E-05
						1.33E-06	5.45E-05

Straight Line Fit Statistics

$C_D = .019026 + .053846 C_L^2$

Mean = 2.336923076923E-02

SEE = 3.472092810701E-04

(SEE = Standard Error of Estimate)

MODEL M20K

FLT NO: 122

FEATHERFILL VERIFICATION

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	48	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
163	162.5	215.9	.8637	2857	.1828	.0208	.0334	48	.0684
159	158.6	198.4	.8641	2842	.191	.0206	.0365	48.5	.0755
155.4	155	188.7	.8645	2836	.1995	.021	.0398	47.6	.0808
152.3	151.9	178.4	.8648	2832	.2074	.0211	.043	47.4	.087
148.3	147.9	165.5	.8652	2826	.2182	.0212	.0476	47.1	.0958
144.1	143.8	152.7	.8657	2822	.2307	.0213	.0532	46.9	.1065
139.5	139.2	139.3	.8632	2818	.2458	.0214	.0604	46.8	.1206
135	134.7	128.5	.8604	2811	.2617	.0217	.0685	46.1	.1348
128.4	128.1	112.6	.8562	2808	.2889	.022	.0835	45.5	.1622
122.4	122.2	106.9	.8542	2804	.3174	.024	.1007	41.6	.1791
117.4	117.2	100.2	.8519	2801	.3445	.0254	.1187	39.3	.1993
113.2	113	92.5	.8496	2800	.3704	.0261	.1372	38.3	.2243
109.9	109.7	86.4	.8478	2797	.3925	.0266	.154	37.6	.2473

FEATHERFILLED WINGS, FREE TRANSITION, FLT 122

11-5-84

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0186			0.0186		
0.1828	0.0334	0.0208	0.0011	0.0007	0.0204	1.87E-07	1.87E-07
0.1910	0.0365	0.0206	0.0013	0.0008	0.0205	5.14E-09	5.14E-09
0.1995	0.0398	0.0210	0.0016	0.0008	0.0207	8.86E-08	8.86E-08
0.2074	0.0430	0.0211	0.0019	0.0009	0.0209	5.25E-08	5.25E-08
0.2182	0.0476	0.0212	0.0023	0.0010	0.0211	7.78E-09	7.78E-09
0.2307	0.0532	0.0213	0.0028	0.0011	0.0214	1.12E-08	1.12E-08
0.2458	0.0604	0.0214	0.0037	0.0013	0.0218	1.47E-07	1.47E-07
0.2617	0.0685	0.0217	0.0047	0.0015	0.0222	2.56E-07	2.56E-07
0.2889	0.0835	0.0220	0.0070	0.0018	0.0230	9.82E-07	9.82E-07
0.3174	0.1007	0.0240	0.0101	0.0024	0.0239	1.06E-08	1.06E-08
0.3445	0.1187	0.0254	0.0141	0.0030	0.0248	3.17E-07	3.17E-07
0.3704	0.1372	0.0261	0.0188	0.0036	0.0258	8.54E-08	8.54E-08
0.3925	0.1541	0.0266	0.0237	0.0041	0.0267	8.40E-09	8.40E-09
						2.16E-06	5.42E-05

Straight Line Fit Statistics

$C_D = .018616 + .052420C_L^2$

Mean = 2.255384615385E-02

SEE = 4.429787956701E-04

(SEE = Standard Error of Estimate)

MODEL M20K

FLT NO: 123

FEATHERFILL VERIFICATION

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	46	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
164.8	164.3	219	.8626	2841	.1778	.0205	.0316	48.9	.0659
156.8	156.4	191.2	.8634	2837	.196	.0207	.0384	48.2	.0791
149.3	148.9	171.2	.8639999	2833	.2158	.0215	.0466	46.5	.0924
141.1	140.8	149.1	.8646	2825	.2409	.0222	.058	45	.1115
130.6	130.3	124.9	.858	2821	.2806	.0233	.0787	43	.1445
125	124.8	114.1	.8549	2816	.3057	.0241	.0934	41.4	.1652
120.3	120.1	104.9	.8523	2813	.3296	.0248	.1086	40.3	.1869
117	116.8	97.7	.8504	2811	.3481	.0251	.1212	39.9	.2065
112.9	112.7	92	.8484	2809	.3735	.0262	.1395	38.2	.2274
106.6	106.4	88.4	.8367	2806	.4184	.0295	.1751	33.9	.2536

FEATHERFILLED WINGS, FREE TRANSITION, FLT 123

11-5-84

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0186			0.0186		
0.1778	0.0316	0.0205	0.0010	0.0006	0.0204	1.12E-05	4.02E-09
0.1960	0.0384	0.0207	0.0015	0.0008	0.0208	8.74E-06	1.78E-08
0.2158	0.0466	0.0215	0.0022	0.0010	0.0213	6.16E-06	3.65E-08
0.2409	0.0580	0.0222	0.0034	0.0013	0.0220	3.29E-06	4.95E-08
0.2806	0.0787	0.0233	0.0062	0.0018	0.0232	3.66E-07	1.33E-08
0.3057	0.0935	0.0241	0.0087	0.0023	0.0240	6.40E-08	3.24E-09
0.3296	0.1086	0.0248	0.0118	0.0027	0.0249	1.30E-06	1.65E-08
0.3481	0.1212	0.0251	0.0147	0.0030	0.0257	3.50E-06	3.13E-07
0.3735	0.1395	0.0262	0.0195	0.0037	0.0267	8.64E-06	2.79E-07
0.4184	0.1751	0.0295	0.0306	0.0052	0.0288	2.51E-05	4.87E-07
						1.22E-06	6.84E-05

Straight Line Fit Statistics

$C_D = .018376 + .057972C_L^2$

Mean = 2.379000000000E-02

SEE = 3.905951011668E-04

(SEE = Standard Error of Estimate)

MODEL M20K

FLT NO: 124

FEATHERFILL VERIFICATION

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	46	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
165.7	165.2	218.5	.8626	2840	.1758	.0201	.0309	49.8	.0657
159	158.6	201.5	.8631	2826	.1899	.021	.0361	47.7	.0734
156.3	155.9	188.7	.8635	2819	.196	.0207	.0384	48.4	.0793
153.6	153.2	179.9	.8638	2812	.2025	.0208	.041	48.1	.0842
150.1	149.7	167.1	.8643	2798	.2109	.0207	.0445	48.4	
9.179999E-02									
144.1	143.8	156.3	.8645	2789	.228	.0219	.052	45.8	.1015
141.5	141.2	146	.8639	2782	.2359	.0215	.0556	46.4	.1102
135.8	135.5	136.2	.8611	2778	.2556	.0227	.0653	44.1	.1231
130.2	129.9	125.4	.858	2776	.2778	.0236	.0772	42.4	.1398
124.5	124.3	113.6	.8547	2771	.3032	.0243	.0919	41.1	.1614
121.1	120.9	107.4	.8529	2768	.3201	.0249	.1024	40.1	.1755
117.4	117.2	100.8	.8509	2764	.34	.0256	.1156	39.1	.1927
114.5	114.3	96.6	.8495	2760	.3569	.0264	.1274	37.9	.2059
110.4	110.2	88.4	.8471	2756	.3832	.0269	.1469	37.2	.2334

FEATHERFILLED WINGS, FREE TRANSITION, FLT 124

11-6-84

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.0000	0.0184			0.0184		
0.1758	0.0309	0.0201	0.0010	0.0006	0.0203	5.85E-08	7.24E-06
0.1899	0.0361	0.0210	0.0013	0.0008	0.0207	1.17E-07	5.64E-06
0.1960	0.0384	0.0207	0.0015	0.0008	0.0208	1.04E-08	4.97E-06
0.2025	0.0410	0.0208	0.0017	0.0009	0.0210	2.58E-08	4.29E-06
0.2109	0.0445	0.0207	0.0020	0.0009	0.0212	2.24E-07	3.46E-06
0.2280	0.0520	0.0219	0.0027	0.0011	0.0216	7.11E-08	1.96E-06
0.2359	0.0556	0.0215	0.0031	0.0012	0.0219	1.28E-07	1.38E-06
0.2556	0.0653	0.0227	0.0043	0.0015	0.0225	6.18E-08	3.38E-07
0.2778	0.0772	0.0236	0.0060	0.0018	0.0232	1.79E-07	2.09E-08
0.3032	0.0919	0.0243	0.0085	0.0022	0.0241	4.79E-08	1.10E-06
0.3201	0.1025	0.0249	0.0105	0.0026	0.0247	3.00E-08	2.87E-06
0.3400	0.1156	0.0256	0.0134	0.0030	0.0255	4.68E-09	6.25E-06
0.3569	0.1274	0.0264	0.0162	0.0034	0.0263	2.15E-08	1.04E-05
0.3832	0.1468	0.0269	0.0216	0.0040	0.0274	2.98E-07	1.95E-05
						1.28E-06	6.94E-05

Straight Line Fit Statistics

$C_D = .018448 + .061277C_L^2$

Mean = 2.293571428571E-02

SEE = 3.263943129077E-04

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 132

4-3-85

PAINT/FEATHERFILL N1173W

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
10000	41	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
157.2	156.6	209.2	.86	2627	.1809	.0218	.0327	46	.0642
151.7	151.2	186.1	.8607	2609	.1928	.0215	.0372	46.4	.0737
146.4	145.9	169.1	.8613	2596	.2059	.0218	.0424	45.9	.0831
141.8	141.4	153.7	.8618	2589	.2188	.0218	.0479	45.9	.0939
138	137.6	145	.862	2577	.2299	.0223	.0529	44.9	.1012
133.6	133.2	135.7	.8609	2571	.2447	.0229	.0599	43.6	.1114
131.1	130.8	124.9	.8581	2564	.2534	.0223	.0642	44.9	.123
126	125.7	114.1	.855	2552	.2729	.0228	.0745	43.8	.1393
117.2	116.9	104.4	.8512	2545	.3144	.0258	9.880001E-02	38.7	.1634
110.1	109.9	91.5	.8379	2536	.3548	.0269	.1259	37.2	.2002
105	104.8	85.3	.8355	2531	.3893	.0288	.1515	34.8	.2249

PAINTED AIRPLANE, FREE TRANSITION, FLT 132

(Wings not Sanded after Painting)

4-3-85

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.00000	0.01899			0.01899		
0.1809	0.03272	0.02180	0.00107	0.00071	0.02106	5.52E-07	2.95E-06
0.1928	0.03717	0.02150	0.00138	0.00080	0.02134	2.63E-08	4.07E-06
0.2059	0.04239	0.02180	0.00180	0.00092	0.02167	1.73E-08	2.95E-06
0.2188	0.04787	0.02180	0.00229	0.00104	0.02201	4.61E-08	2.95E-06
0.2299	0.05285	0.02230	0.00279	0.00118	0.02233	8.88E-10	1.48E-06
0.2447	0.05988	0.02290	0.00359	0.00137	0.02277	1.59E-08	3.82E-07
0.2534	0.06421	0.02230	0.00412	0.00143	0.02305	5.60E-07	1.48E-06
0.2729	0.07447	0.02280	0.00555	0.00170	0.02370	8.05E-07	5.16E-07
0.3144	0.09885	0.02580	0.00977	0.00255	0.02524	3.15E-07	5.21E-06
0.3548	0.12588	0.02690	0.01585	0.00339	0.02695	2.36E-09	1.14E-05
0.3893	0.15155	0.02880	0.02297	0.00436	0.02857	5.19E-08	2.79E-05

Straight Line Fit Statistics

$C_D = .01899 + .06322C_L^2$

Mean = 2.351818181818E-02

SEE = 2.610584515995E-03

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 133

4-4-85

FEATHERFILL/PAINT N1173W

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
6000	65	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
162.6	162.2	201.5	.8723	2645	.1698	.0202	.0288	49.6	.061
154.9	154.6	181.5	.873	2632	.1861	.021	.0346	47.6	.0703
150.8	150.5	170.7	.8732	2630	.1962	.0214	.0385	46.7	.0767
148.2	147.9	163	.8735	2627	.2029	.0216	.0412	46.4	.0815
143.1	142.8	148.1	.8718	2624	.2173	.0217	.0472	46.1	.0928
139.7	139.5	138.8	.8694	2617	.2273	.0218	.0517	45.9	.1012
134.5	134.3	125.4	.8659	2610	.2446	.022	.0598	45.5	.1162
127.7	127.5	113.6	.8627	2606	.2708	.0232	.0733	43.2	.1352
125.6	125.4	108.5	.8612	2602	.2795	.0232	.0781	43.1	.1437
120.6	120.4	96.1	.8569	2600	.3029	.0231	.0917	43.3	.1695
115.2	115	90.5	.8537	2596	.3314	.0249	.1098	40.2	.1886
112.3	112.2	86.4	.8517	2589	.3477	.0256	.1209	39.1	.202
108.4	108.3	81.7	.849	2585	.3726	.0268	.1388	37.3	.2213
129.4	129.2	116.7	.8635	2581	.2612	.0229	.0682	43.7	.1272
125.2	125	108	.861	2578	.2787	.0233	.0777	42.9	.1422
120.2	120	98.7	.8572	2576	.3021	.024	9.129999E-02		
								41.7	.1625
113.6	113.5	93.1	.853	2572	.3376	.0266	.114	37.5	.1826
108.4	108.3	82.3	.849	2570	.3704	.027	.1372	37.1	.2171

PAINTED AIRPLANE, FREE TRANSITION, FLT 133

(Wings not Sanded after Painting)

4-4-85

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.00000	0.01884			0.01884		
0.1698	0.02883	0.02020	0.00083	0.00058	0.02051	9.43E-08	9.92E-06
0.1861	0.03463	0.02100	0.00120	0.00073	0.02084	2.49E-08	5.52E-06
0.1962	0.03849	0.02140	0.00148	0.00082	0.02107	1.12E-07	3.80E-06
0.2029	0.04117	0.02160	0.00169	0.00089	0.02122	1.45E-07	3.06E-06
0.2173	0.04722	0.02170	0.00223	0.00102	0.02157	1.71E-08	2.72E-06
0.2273	0.05167	0.02180	0.00267	0.00113	0.02183	6.67E-10	2.40E-06
0.2446	0.05983	0.02200	0.00358	0.00132	0.02230	8.84E-08	1.82E-06
0.2612	0.06823	0.02290	0.00465	0.00156	0.02278	1.39E-08	2.02E-07
0.2708	0.07333	0.02320	0.00538	0.00170	0.02308	1.51E-08	2.25E-08
0.2787	0.07767	0.02330	0.00603	0.00181	0.02333	7.78E-10	2.50E-09
0.2795	0.07812	0.02320	0.00610	0.00181	0.02335	2.36E-08	2.25E-08
0.3021	0.09126	0.02400	0.00833	0.00219	0.02411	1.27E-08	4.23E-07
0.3029	0.09175	0.02310	0.00842	0.00212	0.02414	1.08E-06	6.25E-08
0.3314	0.10983	0.02490	0.01206	0.00273	0.02518	8.11E-08	2.40E-06
0.3376	0.11397	0.02660	0.01299	0.00303	0.02542	1.38E-06	1.06E-05
0.3477	0.12090	0.02560	0.01462	0.00309	0.02582	5.02E-08	5.06E-06
0.3704	0.13720	0.02700	0.01882	0.00370	0.02677	5.50E-08	1.33E-05
0.3726	0.13883	0.02680	0.01927	0.00372	0.02686	3.59E-09	1.19E-05
						3.20E-06	7.32E-05

Straight Line Fit Statistics

$C_D = .01885 + .05772 C_L^2$

Mean = 2.335000000000E-02

SEE = 2.139582319052E-03

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 137

4-15-85

FEATHERFILL + SANDED PAINT

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	50	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
161.6	161.1	207.7	.8649	2656	.1728	.0206	.0299	48.7	.062
155.4	155	186.6	.8655	2624	.1846	.0208	.0341	48.1	.07
151.3	150.9	175.3	.8658	2612	.1938	.0211	.0376	47.3	.0758
146.8	146.4	160.9	.8663	2605	.2052	.0212	.0421	47.1	.0846
141.4	141.1	147	.8663	2595	.2203	.0217	.0485	46.1	.0954
137.6	137.3	136.7	.8636	2587	.2319	.0218	.0538	45.8	.1051
131.9	131.6	126.5	.8607	2578	.2514	.0229	.0632	43.8	.1181
128.9	128.6	117.7	.8584	2572	.2626	.0227	.0689	44	.1296
123.1	122.9	109.5	.8558	2562	.2867	.0242	.0822	41.4	.1451
119.8	119.6	105.4	.8544	2554	.3017	.0252	.091	39.7	.1542
115.7	115.5	93.1	.8515	2549	.3228	.0246	.1042	40.6	.1807
111	110.8	87.4	.8493	2544	.35	.0261	.1225	38.3	.2003
108.4	108.2	81.7	.8479	2541	.3665	.0262	.1343	38.2	.2193
129.3	129	117.7	.8585	2519	.2556	.0225	.0653	44.4	.1239
120.6	120.4	102.3	.8541	2512	.2929	.024	.0858	41.7	.1527
114.4	114.2	90	.8507	2510	.3251	.0246	.1057	40.7	.1834

PAINTED AIRPLANE, FREE TRANSITION, FLT 137

(Wings Sanded after Painting)

4-15-85

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.00000	0.01896			0.01896		
0.1728	0.02986	0.02060	0.00089	0.00062	0.02067	4.61E-09	6.29E-06
0.1846	0.03408	0.02080	0.00116	0.00071	0.02091	1.19E-08	5.14E-06
0.1930	0.03725	0.02110	0.00139	0.00079	0.02109	9.86E-11	4.35E-06
0.2052	0.04211	0.02120	0.00177	0.00089	0.02137	2.81E-08	3.27E-06
0.2203	0.04853	0.02170	0.00236	0.00105	0.02173	1.20E-09	2.07E-06
0.2319	0.05378	0.02180	0.00289	0.00117	0.02203	5.49E-08	1.30E-06
0.2514	0.06320	0.02290	0.00399	0.00145	0.02257	1.07E-07	3.63E-07
0.2556	0.06533	0.02250	0.00427	0.00147	0.02269	3.78E-08	2.31E-07
0.2626	0.06896	0.02270	0.00476	0.00157	0.02290	4.07E-08	7.47E-08
0.2867	0.08220	0.02420	0.00676	0.00199	0.02366	2.94E-07	2.33E-07
0.2929	0.08579	0.02400	0.00736	0.00206	0.02386	1.87E-08	4.74E-07
0.3017	0.09102	0.02520	0.00829	0.00229	0.02416	1.08E-06	9.75E-07
0.3228	0.10420	0.02460	0.01086	0.00256	0.02492	9.93E-08	3.03E-06
0.3251	0.10569	0.02460	0.01117	0.00260	0.02500	1.60E-07	3.33E-06
0.3500	0.12250	0.02610	0.01501	0.00320	0.02596	1.94E-08	7.76E-06
0.3665	0.13432	0.02620	0.01804	0.00352	0.02664	1.90E-07	1.20E-05
						2.14E-06	5.09E-05

Straight Line Fit Statistics

$C_D = .01897 + .05708 C_L^2$

Mean = 2.313750000000E-02

SEE = 1.905938283647E-03

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 138

4-16-85

5% STRIPS/FEATHERFILL/SANDED PAINT

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	53	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
158.1	157.7	207.7	.8662	2657	.1806	.0219	.0326	45.6	
6.360001E-02									
150.8	150.4	183.5	.8668	2633	.1966	.0223	.0387	44.8	.074
146.4	146	171.2	.8671	2622	.2077	.0227	.0431	44	.081
142.2	141.9	161.4	.8672	2605	.2187	.0234	.0478	42.7	.0873
138	137.7	148.6	.8675999						
				2594	.2312	.0236	.0534	42.4	.0968
133.6	133.3	137.3	.8648	2580	.2453	.0239	.0601	41.8	.1074
129.7	129.4	129.6	.8625	2571	.2593	.0246	.0672	40.6	.1166
125.6	125.4	121.3	.8601	2564	.2757	.0253	.076	39.6	.1284
121.8	121.6	112.6	.8576	2551	.2916	.0256	.085	39	.1415
116.5	116.3	103.3	.8546	2545	.3179	.0268	.1011	37.3	.1611
113.2	113	96.6	.8434	2541	.3361	.0269	.113	37.1	.1791
107.2	107	88.4	.8405	2535	.3738	.0289	.1397	34.6	.2063

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 139

4-17-85

FEATHERFILL/SANDED PAINT/10% STRIPS

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
8000	51	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
158.1	157.7	209.2	.8652	2642	.1796	.0221	.0323	45.3	.0623
151.3	150.9	185.1	.8658	2631	.1952	.0223	.0381	44.8	.0729
146.4	146	169.6	.8663	2611	.2068	.0226	.0428	44.3	.081
141.8	141.5	156.3	.8666	2601	.2196	.0229	.0482	43.7	
7.000001E-02									
138	137.7	147	.8665	2591	.2309	.0233	.0533	42.9	
9.749999E-02									
134.1	133.8	137.8	.8639	2570	.2425	.0238	.0588	42.1	.1057
128.9	128.6	126.5	.8607	2560	.2614	.0245	.0683	40.9	.1192
124.4	124.2	116.7	.8579	2553	.2798	.025	.0783	40	.1336
121.4	121.2	112.6	.8564	2545	.2928	.0259	.0857	38.6	.1413
116	115.8	103.8	.8443	2537	.3196	.027	.1022	37.1	.1616
112.7	112.5	96.6	.8423	2532	.3379	.0273	.1142	36.6	.1785
108.9	108.7	89.5	.8402	2525	.3608	.028	.1302	35.7	.1987
102.9	102.8	83.3	.8372	2520	.4033	.0307	.1626	32.5	.2259

PAINTED AIRPLANE, TRANSITION FIXED AT 0.10c, FLT 139

(Wings Sanded after Painting)

4-17-85

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.00000	0.01988			0.01988		
0.1796	0.03226	0.02210	0.00104	0.00071	0.02201	8.24E-09	8.59E-06
0.1952	0.03810	0.02230	0.00145	0.00085	0.02239	8.99E-09	7.46E-06
0.2068	0.04277	0.02260	0.00183	0.00097	0.02270	1.05E-08	5.91E-06
0.2196	0.04822	0.02290	0.00233	0.00110	0.02306	2.63E-08	4.54E-06
0.2309	0.05331	0.02330	0.00284	0.00124	0.02340	9.60E-09	3.00E-06
0.2425	0.05881	0.02380	0.00346	0.00140	0.02376	1.59E-09	1.51E-06
0.2614	0.06833	0.02450	0.00467	0.00167	0.02439	1.25E-08	2.82E-07
0.2798	0.07829	0.02500	0.00613	0.00196	0.02504	2.02E-09	9.47E-10
0.2928	0.08573	0.02590	0.00735	0.00222	0.02554	1.33E-07	7.56E-07
0.3196	0.10214	0.02700	0.01043	0.00276	0.02662	1.46E-07	3.88E-06
0.3379	0.11418	0.02730	0.01304	0.00312	0.02741	1.25E-08	5.15E-06
0.3608	0.13018	0.02800	0.01695	0.00364	0.02847	2.18E-07	8.82E-06
0.4033	0.16265	0.03070	0.02646	0.00499	0.03061	8.37E-09	3.21E-05
						5.97E-07	8.20E-05

Straight Line Fit Statistics

$C_D = .019882 + .065948 C_L^2$

Mean = 2.503076923077E-02

SEE = 2.730762336247E-03

(SEE = Standard Error of Estimate)

LIFT AND DRAG FROM SPEED POWER DATA

MODEL M20K

FLT NO: 140

4-18-85

FEATHERFILL/SANDED PAINT/25% TRIPPER STRIPS

PRESSURE ALTITUDE	OAT	WING AREA	WING SPAN
10000	46	174.786	36.1

CAS (KTS)	VE (KTS)	BHP	PROP EFF	WEIGHT	CL	CD	CL2	1/CD	CDI/CD
157.6	157	209.2	.8623	2639	.1808	.0215	.0327	46.4	.0648
152.7	152.2	190.2	.863	2621	.1912	.0215	.0366	46.4	.0725
148.2	147.7	178.4	.8632999	2606	.2017	.0221	.0407	45.3	.0787
142.7	142.3	159.4	.8639	2596	.2167	.0221	.0469	45.2	.0906
137.6	137.2	147	.8642	2589	.2323	.0227	.054	44	.1013
134.5	134.1	139	.8645	2580	.2423	.023	.0587	43.4	.1088
129.3	129	130.6	.8619	2567	.2607	.0243	6.800001E-02	41.2	.1196
125.6	125.3	115.2	.8579	2556	.2751	.0232	.0757	43	.139
121.8	121.5	111.6	.8564	2549	.2916	.0246	.085	40.6	.1474
116.9	116.6	101.8	.8534	2541	.3155	.0253	.0995	39.5	.1679
111.8	111.6	96.1	.8417	2536	.3442	.0269	.1184	37.1	.1878
108.8	108.6	87.9	.8487	2529	.3623	.0269	.1313	37.1	.2081
101.7	101.5	80.2	.8362	2524	.4137	.0296	.1712	33.7	.2466

PAINTED AIRPLANE, TRANSITION FIXED AT 0.25c, FLT 140

(Wings Featherfilled and Sanded)

4-18-85

C_L	C_L^2	C_D	C_L^4	$C_L^2 C_D$	C_{DCALC}	Sri	Sti
0.0000	0.00000	0.01953			0.01953		
0.1808	0.03269	0.02150	0.00107	0.00070	0.02145	2.90E-09	6.92E-06
0.1912	0.03656	0.02150	0.00134	0.00079	0.02167	2.98E-08	6.92E-06
0.2017	0.04068	0.02210	0.00166	0.00090	0.02191	3.46E-08	4.12E-06
0.2167	0.04696	0.02210	0.00221	0.00104	0.02228	3.29E-08	4.12E-06
0.2323	0.05396	0.02270	0.00291	0.00122	0.02269	7.65E-11	2.05E-06
0.2423	0.05871	0.02300	0.00345	0.00135	0.02297	9.60E-10	1.28E-06
0.2607	0.06796	0.02430	0.00462	0.00165	0.02351	6.23E-07	2.86E-08
0.2751	0.07568	0.02320	0.00573	0.00176	0.02396	5.81E-07	8.66E-07
0.2961	0.08768	0.02460	0.00769	0.00216	0.02466	4.13E-09	2.20E-07
0.3155	0.09954	0.02530	0.00991	0.00252	0.02536	3.44E-09	1.37E-06
0.3442	0.11847	0.02690	0.01404	0.00319	0.02647	1.88E-07	7.67E-06
0.3623	0.13126	0.02690	0.01723	0.00353	0.02722	9.93E-08	7.67E-06
0.4137	0.17115	0.02960	0.02929	0.00507	0.02955	2.54E-09	2.99E-05
						1.60E-06	7.31E-05

Straight Line Fit Statistics

$C_D = .019533 + .058526C_L^2$

Mean = 2.413076923077E-02

SEE = 2.578718714748E-03

(SEE = Standard Error of Estimate)